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# The value of the I. Q. and teachers' marks in certain high school subjects for predicting teachers' marks in stenography.

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# THE VALUE OF THE I. Q. AND TEACHERS' MARKS IN CERTAIN HIGH SCHOOL SUBJECTS FOR PREDICTING TEACHERS' MARKS IN STENOGRAPHY

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# CHAPTER I

## INTRODUCTION

Guidance of pupils in secondary schools into courses for which they are most suited and into fields of work where they may best gain a livelihood has become an increasingly difficult and interesting problem for educators.

The present study was undertaken in an attempt to discover whether certain measures at hand in the J. M. Atherton High School for Girls, Louisville, Kentucky, could be used to predict degrees of success in the stenography course offered in that school.

"Success" is a very general term and, as commonly used, is ambiguous. In this study success is measured in terms of teachers' marks and has as many degrees as are represented on the percentage scale used by the teachers at Atherton High School. The upper limit of this scale is, of course, 100%. Failure in a course is indicated by a percentage rating below 70%. Any rating of 70% or higher is counted as success, and generally speaking, the higher the rating, the greater the success.

Because of the widespread criticism of teachers' marks in recent years, the writer recognizes their use for criteria of success as one of the limitations of this study. However, in the Louisville schools, they are the only accepted measures of pupil achievement. Graduation from high school depends entirely on marks given by teachers. Pupils are ranked for honors and for

recommendation to college on the basis of teachers' marks. Despite the fact that such marks are likely to be subjective and may be unjust, they are still the criteria of success in rating pupils in most of the public school systems of the country. That the factors which they measure vary from teacher to teacher and from time to time for the same teacher does not alter the fact that the accepted measure of how successful a pupil is in any given course is the teacher's estimate of that pupil's success. As a matter of fact, where a number of teachers' marks in a number of courses are concerned, they have been found to be very valid measures for predicting subsequent academic success.

Success after graduation, as measured by the ability to get and hold a job or to gain promotion, may not be satisfactorily predicted by teachers' marks, but this may be due to the fact that academic and business standards differ, rather than to the fact that either is wrong. It seems likely, too, that personality factors such as neatness, attractiveness, and ability to get along with others contribute more largely to business success than to school success, since many teachers have made an honest attempt to eliminate such subjective

factors in their evaluation of pupil performance.

Teachers of commercial subjects often insist that their marks are quite objective. They claim that pupils are marked strictly on the basis of performance and that performance in stenography is easily and objectively measured. It is beyond the limits of this study to make a thorough evaluation of this claim, but an attempt has been made to describe the marks of the three teachers whose marks have been used. Each teacher was asked to make a statement in answer to the question: What do you mean when you give a mark of 85% in your course? The answers are given below.

> Teacher A: A mark of 85% at the end of any grading period means that of all the material on which grades were rendered, the pupil knew 85%. Subjective judgment is relatively insignificant because shorthand outlines and transcripts from these outlines are either right or wrong.
>
> Teacher B: A mark of 85% for a pupil is the average of all marks recorded during the grading period covered. Marks are given on word lists or letters containing shorthand outlines. To receive a mark of 85% on any particular test, a pupil must have much more than 85% of the material right. This is because we try to hold our standards up to what we consider to be an acceptable office standard of performance.
>
> Teacher C: A mark of 85% means that the pupil, during the period covered by that

> mark, has received an average of 85% on all exercises, written and oral, on which she has had an opportunity to perform. If she is given fifty words from dictation, she is penalized 2% for each error in shorthand outlines or longhand transcription--this is the practice, generally, I believe, among all the shorthand teachers in the department. Errors in other exercises in the first two semesters are penalized in about the same proportion, but the penalty becomes greater as the number of outlines the pupil is expected to know increases. Marks are based on whether shorthand outlines are right or wrong, whether transcriptions follow exactly the shorthand outlines which represented them, and on the length of time taken to complete the exercise.

If pupils make approximately the same marks in two school subjects, it seems safe to say that their success in one may be predicted from their achievement in the other. This thesis, then, has to do with the statistical relationship, or correlation, between marks received in certain high school subjects and marks received in shorthand. If a high relationship should be found to exist between the marks received in a subject preceding shorthand and the marks in shorthand, then pupils might be guided into or away from the stenography course on the basis of their marks in the other subject.

For years commercial teachers and supervisors have complained that their courses are crowded with

mentally inferior pupils. To meet this situation and also to prepare young people for the routine clerical duties which, surveys have shown, make up the bulk of the opportunities in the business world for young workers, commercial curricula have lately been enlarged to include courses in junior business training, general business, office practice, office machines, filing. Even a superficial examination of current city and state commercial curricula will reveal that this movement is well under way at the present time.

In spite of the introduction of these general courses, many pupils continue to elect the traditional commercial courses--bookkeeping, stenography, typewriting. Perhaps this is due to the fact that, whereas a few specialists know that the bulk of jobs for young workers are clerical, the public clings to the idea that office positions may be classified in these three categories and continues to insist that children be trained for one of these vocations. Because this condition exists, courses in stenography continue to be elected by pupils who, in due time, graduate with credit in these subjects but who, the instructors feel, are not qualified nor able to be properly

trained to hold stenographic positions.

For this reason, in the fall of 1935, this study was begun in an attempt to determine whether the I. Q., as determined by the Otis Intelligence Test, Form A, and teachers' marks in sophomore English could be used as predictive measures for degrees of success in high school stenography. That study has been extended to include certain other subjects which precede stenography, in which a majority of the stenography students enroll. These subjects are: Bookkeeping (Units 1 and 2, one semester each); Spanish (Units 1 and 2, one semester each); and Typewriting (Unit 1, one semester). These subjects were selected because they are taken prior to the election of stenography and because marks were available for securing fairly large and seemingly representative numbers of cases.

At Atherton High School, Stenography 1, or the first semester of shorthand, is devoted chiefly to learning the fundamental principles of the subject. The textbook, or manual, for Gregg shorthand, which is taught in the Louisville public high schools, is made up of thirty-six lesson units. Of these, only fifteen are included in the first semester's work. An attempt is made to teach pupils that shorthand is a system of

writing by sound, that the first element in learning to write shorthand is to learn to set down only those sounds of each word that are heard. Attention is called to such idiosyncrasies of spoken English as that the letter c actually has two sounds, a k sound and an s sound, neither of which is the sound of the letter c as it is pronounced in saying the letters of the alphabet. From some such simple beginning, the pupil must learn to write ej for edge, häo̅o̅ for how, bawēl for boil, and so on. The ability to recognize these sound elements is fundamental to the learning of shorthand. Considerable effort is made to develop this sound consciousness in the first semester. During this first semester, also, symbols are taught for all of the sounds in English. After completing the first fifteen lessons of Gregg shorthand, the pupil could write any English word. As a matter of fact, she is taught only the symbols for common words, most of which are included in the Ayres' list of one thousand most common words. The pupil must be able, however, to do more than this. After she has heard a word and written the shorthand symbol for the sound of that word, she must be able to write it back, or transcribe it, into the conventional English spelling. In the first semester

of shorthand pupils must learn (a) to recognize words as made up of sounds; (b) to write the appropriate shorthand symbols for these sounds; (c) to transcribe these symbols accurately into words spelled in the conventional manner. Simple letters and articles are included in the practice material of the first semester.

During the second semester of shorthand, the pupil is taught short-cuts in the combining of the symbols previously learned. The vocabulary which must be mastered becomes increasingly difficult. Many pupils who do not know the meanings of such words as analogical, ethnology, and autocratic must learn to hear the sounds of these words, write shorthand symbols for them, and then transcribe these symbols into correctly spelled English.

The third semester of shorthand is given over largely to taking dictation, which is read back or transcribed, either in pencil or on the typewriter. In addition, during the third semester, the principles of theory, presented in the two preceding semesters, are constantly reviewed. The fourth semester is devoted almost entirely to the taking of dictation for the purpose of oral or written transcription.

This analysis of the content of each of the semesters of shorthand is necessarily very limited, but it may serve to give a better understanding of similarities and differences in the various shorthand units. It should be apparent that success in the second semester is dependent, in large measure, upon what the pupil has learned during the first semester, and that the work of the last two semesters is not concerned chiefly with new shorthand situations but with the ability to use skills developed in the preceding semesters.

The study, in its final form, describes the value of various measures in predicting degree of success in stenography at Atherton High School at the end of each of the four semesters and in predicting degree of success through the four-semester training period. The measures used are listed in Table I.

TABLE I

Summary of Predictive Measures Used

| Degree of Success In | Related Measures |
|---|---|
| Stenography 1 | Otis I. Q., English 3, English 4, Bookkeeping 1 and 2, Spanish 1 and 2, Typewriting 1 |
| Stenography 2 | As above, plus Sten. 1 |
| Stenography 3 | As above, plus Sten. 2 |
| Stenography 4 | As above, plus Sten. 3 |
| Stenography Average | Same as for Sten. 1 |

Certain limitations of the study are recognized by the writer and should be mentioned here. In the first place, the number of cases, 225, is not sufficiently large to make the evidence conclusive on the basis of numbers alone. The interpretation of the data in relation to the findings secured by other investigators should, however, make the findings of this study definitely useful. The findings will be further restricted by the fact that the data are all taken from the records of one school, so that the results must not be interpreted as of significance for dissimilar school situations. A third, and perhaps major limitation, previously discussed, lies in the use of teachers' marks as criteria. In addition to what has already been pointed out, it should be said that in this particular field few satisfactory criteria have been built up. The Hoke Prognostic Test of Stenographic Ability and a battery of tests especially constructed by O. A. Ohmann at the University of Iowa have not been found to have sufficient predictive value to warrant their being used as predictive criteria.[1]

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[1] For results of studies involving the use of the Hoke test, see: Clyde M. Blanchard, "Results of Hoke-Rollinson Research Study," American Shorthand Teacher, October 1928, pp. 37-39, 44; Eva M. Jessup, "The Application of Prognostic and Achievement Tests to Shorthand," The Journal of Commercial Education, June 1928, pp. 173-4; Ethel H. Wood, "An Experiment with Predictive Tests in Stenography," The Journal of Commercial Education, January 1928. For results on Mr. Ohmann's tests, see O. A. Ohmann, "The Possibility of Prognosis in Stenography," Univeristy of Iowa Monographs in Education, Research Studies in Commercial Education, Vol. I, 1926.

The importance of such investigations as the present one may be indicated by calling attention to the fact that whether or not pupils are able to learn stenography; whether or not there are positions available to them if they are able to master stenography; and whether or not those who are given the technical training are emotionally fitted to do stenographic work, seem to be problems of little concern to parents. Teachers of stenography, however, must realize that not only are there not enough jobs but that many of their pupils, even after completing high school stenography, are actually incapable of carrying on as stenographers. If it were possible for guidance counsellors or teachers to demonstrate to pupils and parents that certain pupils are as unfit to learn stenography as to become concert pianists or civil engineers, the educational waste involved in having such pupils spend four semesters trying to acquire a skill which they are incapable of acquiring might be considerably reduced. Further, the emotional distress attendant upon the pupil's constant attempt to do something for which she has neither aptitude nor inclination would certainly be, in many cases, alleviated. Finally, unless some form of guidance in this matter is worked out, the

schools may some day be called to account for thousands of dollars spent in the useless attempt to educate young people for jobs which do not exist. As will be seen by the literature reviewed in the following chapter, the widespread interest of investigators in this field promises much for the future.

# CHAPTER II

## SURVEY OF THE LITERATURE ON PROGNOSIS IN STENOGRAPHY

# CHAPTER 2

## SURVEY OF THE LITERATURE

The most complete lists of commercial education research were found in the United States Office of Education Bulletins for the years 1929 through 1934; in a bibliography compiled by Dr. E. G. Blackstone of the University of Iowa and published in the Business Education World, March 1934; and in the "Commercial Education Research Abstracts," by Dr. Blackstone in the Business Education World, October 1933 and April 1934. General education periodicals were found to contain very little material pertaining to the field of research in commercial education.

Two master's theses, listed in the United States Office of Education Bulletins but not found in the commercial education journals, deal with the relation of intelligence to commercial subjects: Colegrove, Rosa--The Relation of Intelligence to the Learning of Shorthand and Typewriting, Master's Thesis, 1933, University of Wyoming;[1] Anderson, Elizabeth Jane--Commercial Subject Difficulty as Correlated with Intelligence Quotients, Master's Thesis, 1928-9, Temple University, Philadelphia.[2] Two others have to do with the relation of English and

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[1] United States Bureau of Education Bulletins, No. 7, 1934, p. 137

[2] Ibid., No. 23, 1930, p. 251

stenography: Schleppegrell, Adolphine Marie--A Comparative Study of the English and Stenographic Ability of Commercial Students, Master's Thesis, 1927-8, Stanford University;[1] Tietjen, Madeline--Is Correct Use of English An Essential for Success in Shorthand? Master's Thesis, 1933, New York State College for Teachers.[2]

One thesis, unpublished but very briefly discussed in the United States Office of Education Bulletin in which it is listed, is entitled "The Relationship of Intelligence and the Relationship of the Knowledge of English Minimum Essentials to the Student's Ability to Transcribe Shorthand."[3] It was written as a master's thesis at New York University in 1931 by Frances I. Kinne. 120 subjects were involved in the study. The abstract in the Bulletin says: "The coefficient of correlation (in every comparison) is so very low that the only conclusion which can be drawn is that there is apparently practically no relationship between intelligence and the ability to transcribe shorthand or between knowledge of English minimum essentials and the ability to transcribe shorthand as determined by the study."[4]

Published abstracts of theses on the general subject of prognosis for stenography may be classified

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[1] United States Bureau of Education Bulletins, No. 36, 1929, p. 183

[2] Ibid., No. 7, 1934, p. 142

[3] Ibid., No. 16, 1932, p. 355

[3] Ibid., No. 16, 1932, p. 355

into (a) those which deal with the relationship of intelligence, as determined by I. Q., to stenography; and (b) those which deal with the predictive value of teachers' marks in other high school subjects, or with the predictive value of certain objective tests, for stenography.

Three studies of the relationship between I. Q. and stenography are abstracted by Dr. E. G. Blackstone in the April 1934 issue of the Business Education World. One is a study entitled "The Relation of General Intelligence to Achievement in Shorthand." The investigator found a correlation of .46 for 50 first-year Gregg shorthand students between teachers' marks and I. Q. as determined by the Terman Group Test of Mental Ability.[1]

Another study, made at the University of Pittsburgh in 1928, included, in addition to the I. Q., as indicated by the Terman Intelligence Test, the Stanford Revision of the Binet-Simon Vocabulary Test. Correlations in this study were .22 between I. Q. and term averages of teachers' marks in shorthand, and .32 between the vocabulary test score and shorthand scores.[2]

Forrest M. Sandy examined the research on the intelligence of secondary school commercial students. In

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[1]Murray, Jean H.: "The Relation of General Intelligence to Achievement in Shorthand." Abstract--E. G. Blackstone, Business Education World, April 1934, p. 507

[2]Cooley, Mazie R.: "Relation of the I. Q. to Success in Learning Shorthand and Typewriting." Abstract--E. G. Blackstone, Business Education World, April 1934, p. 508

his study he included a summary of the investigations dealing with the relationship of I. Q. and stenography. Five studies, involving 1123 cases, were listed; correlations between teachers' marks in stenography and I. Q. as determined by intelligence tests, ranged from .22 to .46.[1] (Probable errors are not given and cannot be determined from the data available.)

It would seem, if these studies may be taken as fairly significant, that the abilities measured by intelligence tests have only a slight relationship with pupil success in shorthand, as determined by teachers' marks. It is possible that teachers of stenography will take issue with this conclusion, since many of them feel that bright pupils do make better grades in stenography than their average and duller companions and at the present time the I. Q. is the most widely known measure of "brightness." The fault may lie at one end or the other of the studies--perhaps intelligence tests do not measure the abilities needed to learn shorthand; perhaps teachers' marks do not accurately evaluate what the pupils learn. The findings of the studies certainly leave the way open for further investigation to determine: (a) what abilities operate for

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[1] Sandy, Forrest M.: "A Critical Examination of Research Dealing with the Intelligence of Secondary School Commercial Students." Aostract--E. G. Blackstone, Business Education World, October 1933, p. 92

success in shorthand; and (b) what kind of tests best measure achievement in shorthand. The only conclusion that may be made at present with regard to the relation of I. Q. and stenography is that low but significant correlation exists between scores on existing intelligence tests and teachers' marks as indices of success in shorthand.

There is a larger group of studies on the subject of prognosis in stenography on the basis of various objective prognostic or predictive tests. Mrs. Sarah S. Whitley is the author of an article entitled "Predicting Stenographic Success through Prognostic Tests." [1] Mrs. Whitley found a correlation of -.589 between intelligence, as measured by the Army Alpha group test, and time taken to complete the secretarial course in the private secretarial school in which she teaches.[2] She also found a correlation of -.75 between scores on the Hoke Prognostic Test of Stenographic Ability and time taken to complete the course. The correlation of -.75 is high, but it represents a relationship that it is not possible to test in the ordinary secondary school, where pupils are

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[1] Whitley, Sarah S.: "Predicting Stenographic Success through Prognostic Tests," Balance Sheet, March 1932, p. 243.

[2] Where probable errors are not indicated they were not reported in the studies and could not be determined from the data given.

not advanced according to their ability but as they complete specified semester units of work.

In "An Experiment with Predictive Tests in Stenography," Miss Ethel H. Wood used scores on the Hoke test, I. Q. as shown by the Terman Group Test of Mental Ability, and scores on the Monroe Reading Comprehension Test.[1] Her measures of stenography were an achievement test of eight hundred words and teachers' marks. She found a correlation of .463 between grades in advanced shorthand and Hoke scores, and .364 between grades in elementary shorthand and Hoke scores. Her study also showed a higher correlation between I. Q. and advanced shorthand marks than between I. Q. and elementary shorthand marks. Dr. Blackstone, in his abstract of the study, says: "In general, the tests investigated in this study have shown no appreciable value in predicting success or failure in shorthand."[2]

The purpose of a study made by Dr. Mazie Earle Wagner and Eunice Strabel was "to determine whether special training in longhand reading and in vocabulary analysis improves the ease with which high school juniors

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[1] Wood, Ethel H.: "An Experiment with Predictive Tests in Stenography," Journal of Commercial Education, December 1928, January 1929

[2] Wood, Ethel H.: "An Experiment with Predictive Tests in Stenography," Journal of Commercial Education, December 1928, January 1929. Abstract--E. G. Blackstone, Business Education World, April 1934, p. 508

learn to read and write Gregg shorthand."[1] In order to get paired groups, these investigators sought the best predictive measures possible for school marks in shorthand. They correlated teachers' marks on the first-semester shorthand examination and the term average as represented by teachers' marks for first-semester shorthand with sophomore school average, total Regents' average, sophomore average in English, Terman Group Test mental age, Inglis Vocabulary Test, Hoke Prognostic Test of Stenographic Ability, a 10-minute opposites test, Buffalo Reading Comprehension Test, and Buffalo Reading Raw Scores. Correlations ranged from .12 between the 10-minute opposites test and term average in beginning shorthand to .65 between the shorthand term examination and sophomore school average. The conclusion of Dr. Wagner and Miss Strabel was: "It will be readily seen that the most predictive measures available, prior to actual shorthand experience, are the school average for the previous year and the Regents' or final examination average of all examinations taken before studying this subject."[2]

Most comprehensive of all the studies involving the

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[1] Wagner, Mazie Earle and Strabel, Eunice: "Improving Shorthand Grades," Business Education World, June 1935, pages 825 ff.

[2] Ibid., pp. 825-6

Hoke Prognostic Test is that of Clyde Insley Blanchard who assembled the results of an extensive experiment, sponsored by the Gregg Publishing Company.[1] This study attempted to determine the correlation between the Hoke Test and the Rollinson Diagnostic Tests, and to establish norms for the two tests, as shown by scores received from thirty-seven high schools in eighteen states, including tests of 1279 high school students. Dr. Blackstone, in evaluating this study, says: "The established norms and coefficients of correlation indicate that the tests considered have less than ten percent forecasting efficiency."[2]

In the attempt made by O. A. Ohmann, of the University of Iowa, to formulate a group of tests of mental ability that would measure the capacity of an individual to develop skill in stenography, he analyzed the abilities needed in secretarial work and then built tests to measure these abilities.[3] The results on these tests were correlated with the results on a dictation and transcription test. Zero-order correlations ranged from 0.00 to

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[1]Blanchard, Clyde Insley: "Results of Hoke-Rollinson Research Study," American Shorthand Teacher", October 1928, pp. 37 ff.

[2]Blackstone, E. G.: "Commercial Education Research Abstracts," Business Education World, April 1934, p. 509

[3]Ohmann, O. A.: "The Possibility of Prognosis in Stenography," State University of Iowa, Monographs in Education, Research Studies in Commercial Education, No. 1, 1926

.36. These correlations indicate very low relationship between Mr. Ohmann's predictive and achievement tests.

There is marked similarity between the investigation reported by Raymond J. Worley and that undertaken in the study herewith described. Mr. Worley's thesis is entitled Relative Value of the I. Q. and Teachers' Marks for Predicting Success in Shorthand. In an article, "Prognosis in Shorthand," appearing in the Journal of Business Education, Mr. Worley discusses the findings of his study.[1] He wanted to find out "how well the marks in shorthand as given can be predicted from other marks as given and from the I. Q."[2] He correlated marks in shorthand with the I. Q. and with marks in junior high school English, senior high school English, penmanship, modern language, science, and mathematics. He also used the multiple correlation technique to determine whether a combination of modern language, junior high school English, and the I. Q. was more predictive of school marks in shorthand than a combination of modern language and junior high school English. Correlations in this study ranged from .398 between the I. Q. and marks in shorthand, to .759 between marks in modern languages and

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[1] Worley, Raymond J.: "Prognosis in Shorthand," The Journal of Business Education, September 1931, pp. 15-16

[2] Ibid., p. 15

marks in shorthand. A multiple correlation of modern language, junior high school English, and the I. Q. with shorthand gave a coefficient of .765, while the relationship among modern language, junior high school English, and shorthand gave an index of .709. It is evident, in Mr. Worley's study, that teachers' marks in modern language have the highest predictive value of any single high-school subject for stenography, and teachers' marks in junior high school English the next greatest predictive value. It is difficult to understand how Mr. Worley could expect to use marks in senior high school English as predictive measures for stenography, which is customarily elected in the eleventh grade, or the junior year of senior high school, unless he included, as senior high school English, only grades in sophomore English. It is possible that his use of marks in some units of modern language, science, and mathematics, may be open to the same criticism. He does not state in his article which units of these subjects were included.

Most recent of the articles on prognosis in shorthand is that of Margaret E. Duncan.[1] She reviews a

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[1]Duncan, Margaret E.: "Prognostic Testing in Shorthand," The Journal of Business Education, April 1936, pp. 15-16

study "to determine the use of prognostic, standardized, and intelligence tests in the guidance of high school students in the election of commercial subjects," summarizing the conclusions as follows: "(1) Very few of the schools interrogated admitted the use of prognostic tests. The failure to use such tests is probably due to the fact that prognostic tests of proved validity and reliability for predicting success in commercial subjects are not on the market. (2) Standardized tests in such subjects as English, arithmetic, etc., have practically no school use for this purpose. (3) Although intelligence tests are not accorded as high value today as they have been in the past, most schools use them. There are many schools which do not make adequate use of the test results after they have been acquired, however. (4) Only a very small number of schools used the I. Q. for guidance of pupils into or away from the commercial department. Therefore, the use of objective measurements has not yet largely affected the guidance of pupils with reference to their election of commercial subjects. (5) General success in school is used more frequently than any other guidance device because of the convenience with which it may be obtained, and the ease of interpretation."[1]

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[1] Op. Cit., page 15

In her own study, Miss Duncan attempted to determine whether the Intelligence Quotient or the term averages of teachers' marks in ninth grade English and tenth grade English might be used to predict performance in eleventh grade shorthand, as measured by teachers' marks. Miss Duncan found a coefficient of correlation of .742 between teachers' marks in tenth grade English and teachers' marks in eleventh grade shorthand, a coefficient of correlation of .586 between teachers' marks in ninth grade English and teachers' marks in eleventh grade shorthand, and a coefficient of correlation of .491 between the I. Q. and teachers' marks in eleventh grade shorthand.[1] She concluded, "An 'r' of .742 seems high enough to be of practical use."[2] Miss Duncan also computed the coefficient of multiple correlation, which she found to be .7576. On the basis of the zero-order correlations and the multiple correlation, she recommends "this battery of subjects for use in the prediction of shorthand ability."[3] She recognizes certain limitations, such as "the human element, subjectivity of grading, unreliable instruments of measurement, etc.," but she makes no allowances for differences in content of both English and

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[1] Op Cit., page 15
[2] Op Cit., page 15
[3] Op Cit., page 16

stenography courses in other high schools than the one in which she made her study, nor does she give any data as to the number of pupils whose records were involved.

Looking over the literature in the field of prognosis in stenography, one must conclude that on the basis of studies made and reported in commercial education periodicals, there is evidence that intelligence, as measured by intelligence tests, has little to do with achievement in stenography, as measured by teachers' marks. It is also evident that the Hoke Prognostic Test of Stenography Ability, in so far as it has been tested by the investigations reported, does not have a sufficiently high correlation with teachers' marks in shorthand nor with existing objective diagnostic tests to make it a satisfactory predictive instrument for success in stenography. The attempt of one investigator to formulate a set of tests of mental ability that would predict success in shorthand resulted in very low correlations. Scores on reading tests, vocabulary tests, and, in one case, on an opposites test, also have showed very low relationship to stenography. In one study only, and that in a private secretarial school, the Hoke test and the Army Alpha test showed significant correlations, not

with teachers' marks as criteria of success in stenography, but with the time taken to complete the secretarial course. The average of all high school subjects for the year preceding election of stenography and the average of all examinations taken before studying stenography were found by two investigators, working together, to be the best predictive measures for stenography. In one study a significant relationship was found to exist between teachers' marks in stenography and in modern language and between teachers' marks in stenography and teachers' marks in junior high school English; in the same study, multiple correlation showed a high predictive value for stenography of a combination of teachers' marks in junior high school English and modern language. A recent study seems to show a significant predictive value for stenography of the I. Q. and teachers' marks in ninth and tenth grade English.

These findings would seem to indicate that much remains to be done in singling out those factors in English, modern language, and intelligence which do contribute to success in high school shorthand. They leave the way open to further investigation of the relationships which have been found to be of some significance in order to lend further weight to the existing evidence.

They indicate the importance which may be attached to discovering what significance for prediction other high school subjects may have. The present study is unique in that it deals only with successful students--those who have actually graduated from the four-semester course and evaluates the predictive value of the I. Q. and certain high school marks in relation to the degree of success attained.

# CHAPTER III

## THE VALUE OF I. Q. AND TEACHERS' MARKS IN ENGLISH, TYPEWRITING, BOOKKEEPING, AND SPANISH FOR PREDICTING TEACHERS' MARKS IN STENOGRAPHY

The subjects of this study were 225 graduates of the J. M. Atherton High School for Girls, Louisville, Kentucky, who had completed all of their work in stenography in that school and for each of whom there was available an I. Q. rating on the Otis Intelligence Test. Records of teachers' marks were taken from the permanent files of the school, beginning with 1930. The number of pupils for whom marks were secured, together with the mean I. Q. for each group is shown below:

| | Number of cases | Mean I.Q. |
|---|---|---|
| February 1930 | 7 | 92.85 |
| June 1930 | 19 | 105.50 |
| February 1931 | 24 | 101.58 |
| June 1931 | 20 | 103.42 |
| February 1932 | 10 | 103.00 |
| June 1932 | 22 | 102.05 |
| February 1933 | 17 | 107.00 |
| June 1933 | 21 | 109.23 |
| February 1934 | 17 | 105.81 |
| June 1934 | 25 | 106.04 |
| February 1935 | 18 | 107.83 |
| June 1935 | 25 | 102.70 |

As stated in the introduction, this study deals with factors affecting or related to varying degrees of success in the senior high school course in stenography. An effort was made to secure data for pupils who had had comparable high school experience. Success, as previously defined, was taken as graduation from the course, various degrees of success being shown by percentage marks from the three teachers conducting these courses at Atherton High School. Records for girls who had had part of their work at other schools were excluded from the study because it was felt that data for them would not be strictly comparable with data for girls whose entire courses had been pursued at one school. Records were not included for girls who had discontinued the course at any time prior to graduation because it was not possible to determine just why such pupils discontinued. Some of them gave up the study of shorthand because they found they could not do the work satisfactorily; some of them married and left the school; some of them became interested in other curricula and changed their courses. A knowledge of which of the girls who dropped out stopped because of failure would have been valuable in the analysis of factors influencing

success; unfortunately these data could not be determined from available facts.

From the standpoint of educational guidance an accurate description--physical, psychological and socio-economic--of the girls who elected and completed the course in stenography would have contributed a great deal to this study. As adequate records were not available, however, such a description could not be made. Nevertheless an attempt has been made to give a description of the girls graduating in 1936.

Three teachers, who have both stenography majors and others in their classes, were asked how they thought stenography majors differ from other groups. Their statements are given below.

> Teacher A: (Social Studies) In general girls who elect commercial subjects are quite like the others. Because of guidance in the junior high school, I feel that in the sophomore year, particularly, before drop-outs have occurred, many of the commercial pupils are inferior. By the time they come to me in senior classes, they are very like the average pupils in the other curricula. On the whole, even the socio-economic status of these girls does not differ greatly from that of the academic pupils.
>
> Teacher B: (Spanish) It is my observation that it does not make any difference academically whether the pupil is majoring in shorthand or any other curriculum--there are pupils who will work and pupils who won't work majoring in

> shorthand, but this situation exists also with pupils who are majoring in other curricula. On the whole, stenography majors are about as bright, as average, or as dull as the pupils in the other departments. I should say that, in general, the stenography majors do not seem to have comparable social and economic backgrounds with pupils of other curricula.
>
> Teacher C: (English) Many stenography majors are enrolled in my "remedial English" classes. I think, in many cases, such pupils have elected stenography because they lack the background and money necessary to go to college. Because the pupils tell advisers that they cannot go to college, the commercial majors are often recommended to them, without particular regard to their ability. I have had some excellent pupils who were enrolled in stenography classes, but I do not have as many A and B pupils from the commercial curriculum as from the other curricula. Stenography majors are brighter, on the whole, than are the pupils who elect a more or less miscellaneous collection of subjects.

These teachers were chosen because seemingly representative groups of stenography and non-stenography majors are enrolled in their courses.

Stenography graduates of June 1936 are described in Table II by their ages and scholastic averages for all subjects taken during the final four semesters of senior high school as compared with the ages and averages of non-stenography graduates.

TABLE II

Means of Ages and of Junior-Senior Averages
For Stenography and Non-Stenography Graduates
At Atherton High School, June 1936

| | Stenography Graduates, 1936 (23 Cases) Years | Months | Non-Stenography Graduates, 1936 (100 Cases) Years | Months |
|---|---|---|---|---|
| Mean Age | 17 | 9.8 | 17 | 9.1 |
| Standard Deviation | 7.25 | | 7.98 | |
| Scholarship Average (Teachers' Marks) | 82.78 | | 86.01 | |
| Standard Deviation | 4.6 | | 5.5 | |

From the data in Table II and from the I. Q. ratings given in the list on page 28, it is seen that stenography majors are not very different from other graduates, teachers' opinions notwithstanding.

As stated in the introduction, the major purpose of this study is to determine the value of various measures in predicting degrees of success in the stenography course. The measures used were indicated in Table I of the Introduction. Analyses of these measures are given in terms of Pearson product moment correlation coefficients and by appropriate tables. The value of the combined measures in predicting degree of success in stenography is described by multiple correlation coefficients. The various measures used are discussed in the succeeding pages.

The intelligence quotient as an index of pupil ability has achieved such widespread popularity in the last decade that there are doubtless very few large high schools left in the country which do not have records of their pupils in terms of the I. Q., as determined by one or more of the standard intelligence tests. Probably most shorthand teachers would agree with this writer that "bright" children can be and should be more successful in stenography than the less intelligent. Research on the subject, however, as indicated in Chapter 2, has shown, in a number of studies, that the I. Q. has only a slight positive relationship with the marks made by high school shorthand pupils and is therefore of almost no value as a predictive measure in the case of shorthand. In this chapter, the writer will add to the findings of other investigators the coefficients of correlations found between the I. Q., as determined by the Otis Intelligence Test, Form A, and teachers' marks, term averages, for four semesters of shorthand.

All Atherton graduates are required to take two semesters of sophomore English, known as English 3 and English 4. Pupils who elect shorthand are required to take typewriting one semester before beginning stenography.

In addition to these required subjects, most of the shorthand pupils take bookkeeping. In the six-year period covered by this study, more than half of the commercial graduates elected Spanish. Teachers' marks in English 3 and 4, Typewriting 1 (one semester), Bookkeeping 1 and 2 (one semester each), and Spanish 1 and 2 (one semester each) were selected as the most likely data for a study of predictive value, because they precede stenography and because teachers' marks for them were available.

There is an abundance of evidence that teachers of shorthand feel that a knowledge of English is of considerable importance in the making of a good stenographer. In an article in the Balance Sheet, Sister Mary Esther, of Mercyhurst College, makes the following statement regarding a study of transcription errors: "34% of the total errors are those in English."[1] In the same article she quotes Charles Reigner, author of a widely used dictation book: "'No relation between subjects is quite so intimate and vital as that between shorthand and English.'"[2] She also quotes Mazie R. Cooley: "'The biggest problem in teaching shorthand isn't shorthand at all--it is English.'"[3]

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[1]Sister Mary Esther: "The Problem of Carry-Over of Knowledge and Ability in Grammar, Arithmetic, and Handwriting," Balance Sheet, January 1935, pp. 244-5

[2]Ibid., p. 245

[3]Ibid., p. 245

Speaking as a teacher of commercial subjects, J. Walter Ross says: "In a word, whether we like it or not, if we are to improve our products--stenographers and correspondents--we must be primarily expert teachers of fundamental English.....We must teach and reteach these fundamentals in an intensive, systematic, thorough manner.....This improvement, in my humble opinion, will be fully realized only when the English department puts more emphasis on the mechanics of English."[1]

In an article by Edith Hess, she says: "Too much emphasis cannot be laid on a thorough knowledge of English for students who plan to study shorthand and become stenographers. The students who have had training in English in high school will find shorthand much easier than those who have had little preparation.....Some students will never become good stenographers because they are poor in English.....The shorthand teacher can do much to improve her students by cooperating with the English department in helping shorthand students overcome their weaknesses."[2]

---

[1]Ross, J. Walter: "What To Do About English," Balance Sheet, Sept. 1935, p. 37

[2]Hess, Edith: "Importance of English in the Study of Shorthand," Modern Business Education, pp. 7-8

In discussing his own study, Mr. Worley makes an interesting comment on the use of English as a predictive measure for stenography. He says: "Just why marks in English should be taken in preference to other marks does not seem to be clear in the minds of those who advocate this policy. It is true that a prospective stenographer (carrying the shorthand writing a number of steps farther) to be successful must be proficient in English grammar and composition and must be able to recognize, spell, and use properly a rather large vocabulary of words spoken by others. So far as these factors are significant, there should be a correlation to the extent that the English covered approximates 'English situations' which arise in stenographic work."[1]

The opinion of these writers on the subject of the relation between shorthand and English is typical of that of many shorthand teachers. A study of the relationship between teachers' marks in English and teachers' marks in shorthand should show whether some of the writers cited in the preceding paragraphs are justified in their insistence on the dependence of shorthand upon English.

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[1]Worley, Raymond J.: "Prognosis in Shorthand," The Journal of Business Education, Sept. 1931, p. 14

The sophomore English course at Atherton is divided into semesters of work, called English 3 and English 4. For some years, in Louisville high schools, English 3 has been chiefly a course in English composition, and English 4 largely a literature course. It was thought that one or the other of these units might give a sufficiently higher correlation with stenography than the other to make it a useful predictive measure. If proficiency in either English composition or English literature seemed to bear a higher relationship to stenography, certain factors might be determined which could be used as a starting point from which to develop a better foundation for stenography.

In evaluating predictive measures of degree of success in stenography, as previously stated, data from twelve classes (February 1930 to June 1935) were combined to secure a total population of 225. In the opinion of the writer, this twelve-semester spread has more merit than data would have for the same number of students taken from a single semester. Educational guidance, to have practical value, should make use of factors that remain relatively constant over an extended period of time. Since the present analysis covers a

six and one-half year period, such factors as do not change greatly should be apparent, within the limitations of the data, and general trends, if there are any, should be discovered.

Means of teachers' marks for the 225 cases, together with standard deviations and ranges, are given in Table III.

TABLE III

Means, Standard Deviations, and Ranges of Teachers' Marks and of I. Q. Ratings for Stenography Graduates of the J. M. Atherton High School for Girls, 1930-1935

| Subject | Number | Mean | Standard Deviation | Range |
|---|---|---|---|---|
| I. Q. | 225 | 104.44 | 8.3 | 80-126 |
| English III | 225 | 80.36 | 7.1 | 55-97 |
| English IV | 225 | 80.57 | 8.5 | 82-96 |
| Typing I | 225 | 82.71 | 7.9 | 49-98 |
| Bookkeeping I | 176 | 83.09 | 7.7 | 63-98 |
| Bookkeeping II | 183 | 81.53 | 7.5 | 52-99 |
| Spanish I | 136 | 81.36 | 9.7 | 37-98 |
| Spanish II | 136 | 80.01 | 11.6 | 24-97 |
| Stenography I | 225 | 82.76 | 7.6 | 51-97 |
| Stenography II | 225 | 82.67 | 6.7 | 56-96 |
| Stenography III | 225 | 83.30 | 6.9 | 55-97 |
| Stenography IV | 225 | 80.36 | 7.2 | 50-96 |

The means for stenography are slightly higher, perhaps, than they would have been, had all the pupils been included who enrolled in the stenography classes in the years covered by the study. Records of drop-outs were not used in the study, because the criterion of success was high school graduation, including the completion of four semesters of shorthand. Records of girls who failed the various semester units but who later completed these units are included. The mean of 104.44 for I. Q. indicates, as might be expected, that girls who completed the high-school course, including four terms of shorthand, were approximately average. They are superior, on the average, to the usually accepted average I. Q. of 100. An average I. Q. of 104.44 with the standard deviation of the distribution being 8.3 is 10.8 probable errors above a mean I. Q. of 100.[1]

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[1] Proof:

$$PE_M = .6745 \frac{8.3}{\sqrt{225}} = .37$$

$$\frac{104.44 - 100}{.37} = 10.8$$

Product-moment correlation coefficients are given in Table IV. These were calculated by use of the usual formula.[1]

TABLE IV

Correlations Between Teachers' Marks In Four Semesters Of Stenography with I. Q. and with Teachers' Marks In Sophomore English, First-Semester Typewriting, First-Year Bookkeeping, and First-Year Spanish. J. M. Atherton High School for Girls (1930-1935)

| Variable | Stenography 1 | Stenography 2 | Stenography 3 | Stenography 4 | Sten. Aver. | Number of Cases |
|---|---|---|---|---|---|---|
| I. Q. | .32±.040 | .37±.039 | .37±.039 | .36±.039 | .44±.034 | 225 |
| English 3 | .32±.040 | .46±.036 | .44±.036 | .46±.036 | .52±.033 | 225 |
| English 4 | .37±.039 | .40±.038 | .36±.039 | .34±.039 | .46±.035 | 225 |
| Typewriting 1 | .38±.039 | .40±.038 | .25±.042 | .30±.041 | .41±.037 | 225 |
| Bookkeeping 1 | .50±.038 | .57±.034 | .46±.040 | .41±.042 | .60±.033 | 176 |
| Bookkeeping 2 | .44±.040 | .53±.036 | .42±.040 | .25±.047 | .51±.037 | 183 |
| Spanish 1 | .69±.030 | .70±.030 | .46±.046 | .49±.044 | .72±.030 | 136 |
| Spanish 2 | .43±.047 | .43±.047 | .39±.049 | .35±.051 | .50±.043 | 136 |
| Stenography 1 | | .64±.027 | .48±.035 | .47±.035 | | 225 |
| Stenography 2 | | | .52±.033 | .51±.033 | | 225 |
| Stenography 3 | | | | .55±.031 | | 225 |

Table IV should be read across, thus: First line--Correlation of I. Q. with Stenography 1 is .32, P. E.±.040, Correlation of I. Q. with Stenography 2 is .37, P. E.±.039; etc. to the last column which shows the number of cases involved in the correlations in each row.

[1] Dunlap, J. W. and Kurtz, A. L.: Handbook of Statistical Nomographs, Tables and Formulas (Formula 179)

Examination of Table IV reveals that all of the coefficients of correlation are positive. Because the subject matter of the courses included in this study is very different from the content of the stenography course, it is not surprising that few of the correlations between single predictive measures and degrees of success in any one semester of stenography are sufficiently high for anything but group prediction. It may seem strange that the relationship between marks in Spanish 1 and the four-semester average in stenography is much higher than any of the others. The most reasonable explanation for this seems to the writer to lie in the fact that Spanish 1 and 2 and Stenography 1 and 2 are very largely language subjects. That the relationship between Spanish 1 and stenography is greater than the relationship between the English courses and stenography seems to the writer to be due to the greater similarity in the special kind of learning factors common to foreign language and stenography. In view of the explanation of the content of the Stenography 1 course in the introduction, this similarity should be apparent to anyone who has studied foreign language.

The predictive measures employed in this study are ranked in Table V for each of the four semesters of shorthand and for the four-semester average.

TABLE V

Predictive Measures in Order of Rank for the Four Semesters of Stenography and for the Four-Semester Average

| Sten. 1 | Sten. 2 | Sten. 3 | Sten. 4 | Four-Semester Sten. Average |
|---|---|---|---|---|
| Span. 1 | Span. 1 | Sten. 2 | Sten. 3 | Span. 1 |
| Bkkg. 1 | Sten. 1 | Sten. 1 | Sten. 2 | Bkkg. 1 |
| Bkkg. 2 | Bkkg. 1 | Bkkg. 1 | Span. 1 | Engl. 3 |
| Span. 2 | Bkkg. 2 | Span. 1 | Sten. 1 | Bkkg. 2 |
| Type. 1 | Eng. 3 | Eng. 3 | Eng. 3 | Span. 2 |
| Eng. 4 | Span. 2 | Bkkg. 2 | Bkkg. 1 | Eng. 4 |
| Eng. 3 | Eng. 4 | Span. 2 | I. Q. | I. Q. |
| I. Q. | Type. 1 | I. Q. | Span. 2 | Type. 1 |
| | I. Q. | Eng. 4 | Eng. 4 | |
| | | Type. 1 | Type. 1 | |
| | | | Bkkg. 2 | |

Table V shows that the best measures found in this study for predicting teachers' marks, or degrees of success in Stenography 1 were teachers' marks in Spanish 1; the next measures, in order of predictive value, are teachers' marks in Bookkeeping 1; etc. It seems important that teachers' marks in some courses are so superior to those in other courses in predicting degree of success in stenography and that I. Q. ratings are so low in the rankings. A complete explanation of this situation would require an analysis of all the factors affecting learning in stenography. Such an analysis is beyond the limits of this study and could not be made with the data available.

The implication of these findings seems to be that more attention should be given by guidance counsellors to previous school achievement. In view of the low predictive value of the I. Q. ratings, it might be well for teachers who are trying to find out why pupils fail to interview teachers in whose courses such pupils have been previously enrolled. The present practice of examining the I. Q. rating when a pupil has difficulty and deciding that the problem is solved because the I. Q. is low is certainly not justified by the present findings nor by those reported in the literature.

One study of 50 cases showed a coefficient of correlation of .46 between term averages in shorthand and I. Q. as indicated by the Terman Group Test of Mental Ability.[1] The coefficient of correlation in another study was .22 between I. Q. as indicated by the Terman test and term averages in shorthand.[2] A review of five studies, involving 1123 cases, found coefficients of correlation ranging from .22 to .46 between teachers' marks in stenography and the I. Q.[3]

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[1] Murray, Jean H.: "The Relation of General Intelligence to Achievement in Shorthand," Op. Cit., p. 507.

[2] Cooley, Mazie R.: "Relation of the I. Q. to Success in Learning Shorthand and Typewriting," Op. Cit., p. 508

[3] Sandy, Forrest M.: "A Critical Examination of the Research Dealing with the Intelligence of Secondary School Commercial Students," Op. Cit., p. 92

Dr. Blackstone, in his abstract of this study, referred to earlier, says, "This correlation is larger than the correlation for typing, but its prediction for efficiency is only about 10 percent better than chance." Wagner and Strobel found a coefficient of .39 between Terman Mental Age and a shorthand term examination.[1] Certainly the relationship found to exist in the present study between teachers' marks in shorthand and the I. Q. does not justify the use of the I. Q. to predict success in shorthand at Atherton, as measured by teachers' marks.

The records of those pupils whose I. Q.s were 110 and above were correlated with shorthand marks. 59 pupils, or slightly more than 25% of the group had intelligence quotients of 110 or over. The I. Q.s of this selected group ranged from 110 to 126. The range of marks was 80 to 97. These students obviously would be considered definitely "bright." Inter-correlations were also made between the marks these pupils made in the four units of stenography. The resulting coefficients of correlation are shown in Table VI.

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[1] Blackstone, E. G.: "Commercial Education Research Abstracts," The Business Education World, October 1933, page 92

TABLE VI

Correlations of I. Q.s of 110 and Above
With Teachers' Marks in Stenography
And Inter-Correlations of the Stenography Marks
Of 59 Pupils of the J. M. Atherton
High School for Girls (1930-35)

| | Sten. 2 | Sten. 3 | Sten. 4 | I. Q. |
|---|---|---|---|---|
| Sten. 1 | .74±.040 | .52±.069 | .43±.070 | .40±.074 |
| Sten. 2 | | .75±.039 | .44±.090 | .28±.076 |
| Sten. 3 | | | .56±.060 | .11±.088 |
| Sten. 4 | | | | .16±.088 |

Table VI should be read across, thus: Coefficient of Correlation of Stenography 1 with Stenography 2, .74, Probable Error ±.04; Correlation of Stenography 1 with Stenography 3, .75, Probable Error ± .039; etc.

Reading Table VI across to the last column seems to show a slight positive correlation between the I. Q. and achievement in Shorthand 1; a relationship of .40±.070 is not considered highly significant, statistically. In the case of the other three units of stenography, the relationship is even less.

The correlations of .74 between achievement in the first and second semesters of stenography and .75 between the second and third semesters are almost high enough to warrant using them for predictive purposes. It would seem that when a pupil of high I. Q. makes a successful beginning in stenography, she is quite likely to continue her success until the last semester.

If the content of each semester's work in shorthand was analyzed correctly in earlier pages of this discussion, it seems possible that the high relationship between the first three semesters of shorthand may be due to the fact that they have more subject matter and drill procedure in common than any of them has in common with the content and drill in the fourth semester.

The difference between the correlation of .32 for I. Q. and Stenography 1, for all pupils, and that of .40 for I. Q. and Stenography 1, for bright pupils, indicates that the predictive value of I. Q. for bright pupils is significantly higher than it is for all pupils. A difference must be equal to four times its probable error in order to be statistically significant. In this case the difference of .08 is equal to eight times the probable error of the difference, .010.

A second supplementary study was made to determine the distribution of the marks of the entire 225 pupils in each of the four units of stenography and the distribution and median of the I. Q. for each set of marks. The results are shown in Table VII.

## TABLE VII

Range and Distribution of Marks
And Median I. Q. According to Marks
For Each of the Four Semester Units of Stenography
For 225 Pupils of the J. M. Atherton High School for Girls

| | STENOGRAPHY 1 | | | STENOGRAPHY 2 | | |
|---|---|---|---|---|---|---|
| Marks | No. | I. Q. Range | Median I. Q. | No. | I. Q. Range | Median I. Q. |
| A | 10 | 100-126 | 117 | 3 | 93-118 | 106 |
| B | 57 | 88-123 | 107.5 | 57 | 92-126 | 110 |
| C | 84 | 80-121 | 103 | 93 | 86-122 | 103 |
| D | 64 | 86-118 | 101 | 66 | 80-118 | 102 |
| E | 10 | 88-110 | 100 | 6 | 88-104 | 94.5 |

| | STENOGRAPHY 3 | | | STENOGRAPHY 4 | | |
|---|---|---|---|---|---|---|
| Marks | No. | I. Q. Range | Median I. Q. | No. | I. Q. Range | Median I. Q. |
| A | 12 | 93-124 | 117 | 8 | 101-124 | 114 |
| B | 55 | 87-126 | 108 | 41 | 86-126 | 108 |
| C | 100 | 80-123 | 103 | 107 | 80-123 | 105 |
| D | 51 | 83-118 | 102 | 63 | 80-120 | 101 |
| E | 7 | 91-107 | 95 | 6 | 92-108 | 97 |

Table VII should be read across, as follows: A grade of A in Stenography 1 was made by 10 pupils, the range of their I. Q.s was 100-126, the median I. Q. of those who made A was 117; A grade of A was made in Stenography 2 by 3 pupils, the range of their I. Q.s was 93-118, the median I. Q. was 106; etc.

If Table VII is examined to observe the range of I. Q. for A, B, C, D, E grades (95-100%, 88-94%, 70-80%, below 70%, respectively), the low relationships shown in Table 2 on Page are again apparent. Some pupils, whose I. Q.s were registered as low as 93 on the school records, were able to make grades of A in Stenography 2 and 3, while one pupil whose I. Q. was as high as 110, failed in Stenography 1. Intelligence quotients of 104, 107 and 108 are included in the failures of the second, third, and fourth semesters. The pupil whose I. Q. was the highest included in this study, 126, made A in the first semester and thereafter dropped to B for the remainder of the course. No pupil whose I. Q. was less than 90 made an A grade in stenography during the six years covered by this study.

Marks of A in Stenography 2 were made by only three of the 225 pupils. Since the study covers a six-year period and includes marks given by three teachers, it seems reasonable to conclude that Stenography 2 is the most difficult of the four units of shorthand. These three A grades made by three pupils of widely varying abilities, according to their I. Q.s, 93, 106,

and 118, are another index that the intelligence quotient is a very uncertain guide to pupil marks in shorthand. The number of pupils in each of the grade rankings in each unit, if shown on a distribution curve, would almost fall into a normal distribution curve, the discrepancy lying in the slightly excessive number of D grades.

Inspection of the column of Table IV, headed Median I. Q., lends some weight to the evidence of teachers whose opinion it is that intelligence plays a significant role in achievement in stenography. In three units out of four, the median I. Q. decreases as the grade-rating decreases. Only in Stenography 2, which appears, by a number of criteria, to be the bête noir for the would-be stenographer, does this descending scale fail to appear.

Moreover, the median I. Q. for failures in all units is never more than 100; in three units, it is less than 100. This descending scale of medians must, of course, be weighed along with other considerations, such as the correlations secured and the wide range in the distribution of I. Q.s for each grade on the scale.

Whether bright pupils do not work up to their capacities, or lack necessary motivation, or whether the bright pupils who are responsible for the difference in medians in this study possessed, in addition to the abilities measured by intelligence tests, other ability factors necessary for successful accomplishment in stenography, will only be discovered by further research on the subject. It is evident that pupils of higher I. Q. can make better grades. Why all of them do not is one of the unsolved problems in the field.

Table VII shows a total of 29 failures, approximately 13%, of all pupils who finally completed the stenography course at Atherton High School. It is important in guidance to attempt to avoid these failures. However, the range of the I. Q.s of pupils making a mark of E, 88 to 110, seems to show that the I. Q. is of as little value in guiding pupils away from stenography as it is in guiding them into the course. It is evident from the data included in Table VII that teachers would not be justified in warning a pupil, whose I. Q. lay in the range of 88 to 110, not to take stenography. Such pupils may fail one or more units of stenography,

but, in spite of this they may be able to complete the course. It was found, in going over the raw data of this study, that six girls had failed in two units of stenography. The I. Q.s of these individuals ranged from 88 to 104, five lying between 88 and 96. In only one case did a girl with an intelligence quotient of 100 fail in more than one semester of shorthand. This seems to offer very slender evidence that pupils at Atherton whose I. Q.s are above 100 are unlikely to fail in more than one semester's work in stenography, but this evidence is so slight as to be of almost no consequence.

Pupils whose averages in Shorthand 4 are in the range between 70 and 80 constitute an even more serious guidance problem than do pupils who fail. This is because most pupils who make failing grades and have to repeat the work of the last semesteror take a special examination covering it realize that they are not actually able to do stenographic work and usually do not try to secure stenographic employment. Pupils who make any sort of passing grade in the fourth semester

of stenography, however, seem to feel that they are qualified as stenographers by virtue of having passed the required high school course in shorthand. Teachers know how inadequate are the backgrounds and abilities of many such pupils and how insufficient is their training for stenographic work in a business office.

Table VIII shows the range of D marks in Stenography 4, the number of pupils in six I. Q. groupings, and the percentage of the total number of pupils making marks of D within the six I. Q. groupings.

TABLE VIII

| I. Q. Grouping | Range of Marks | No. of Pupils | % of Total |
|---|---|---|---|
| 110-120 | 71-77 | 6 | 9.5 |
| 105-109 | 70-77 | 8 | 12.7 |
| 100-104 | 72-79 | 25 | 39.7 |
| 95-99 | 70-79 | 11 | 17.4 |
| 90-94 | 70-78 | 8 | 12.7 |
| 80-89 | 71-78 | 5 | 8.0 |
| | Total | 63 | 100.0 |

The largest percentage of D's in Stenography 4, 39.7%, it is seen in Table 8, was made by pupils whose I. Q.s ranged between 100-104. This I. Q. range includes pupils of average intelligence who might reasonably be expected to receive better marks. Only six pupils, who might be considered bright, since their

I. Q.s fell in the group limits, 110 to 120, made marks of D in the final semester of high school stenography. On the other hand, only five pupils, of the sixty-three who made D in Stenography 4, had I. Q.s under 90. In other words, about the same number of bright and dull girls are included in the list of those making 70 to 79 in Stenography 4. Eight pupils, whose I. Q.s ranged between 90 and 94, also made marks of D. The facts revealed in Table VIII seem to lend added weight to the evidence of the coefficients of Correlation shown in Table IV, that the I. Q. rating of a pupil has little bearing on the marks she may receive in shorthand.

If the last four figures in the column headed "Percentages of Total" in Table VIII are added, it will be seen that 77.8% of all pupils who made marks of D in Stenography 4 had I. Q.s of less than 105. This would seem to indicate a general tendency on the part of pupils whose I. Q.s are 104 or less to make grades that are passing but unsatisfactory from the point of view of guidance into the stenographic course. No data are available at Atherton as to the business success of such pupils. Personality factors and attractive

personal appearance may have made it possible for them to achieve success in offices, in spite of the conviction of teachers that these pupils are inadequately prepared to succeed as stenographers. On-the-job success, however, is not within the scope of this study.

The correlations in Table IV, between English and stenography, are slightly higher than those found between the I. Q. and stenography. The range here is .32±.040 to .46±.036. English marks have therefore, in this study, a slightly higher predictive value for stenography than the I. Q., but the relationship is not high enough to justify using teachers' marks in English alone to predict teachers' marks in stenography. Except in the correlation between English 4 and Stenography 1, English 3 has a noticeably higher relationship with stenography than has English 4, but as the difference in no case is equal to four times its probable error it may not be considered significant. Both the composition and the literature courses have some positive bearing on achievement in stenography--evidently English factors must be taken into account--but neither has the weight that the literature

reflecting popular opinion might lead one to conclude it should have.

Dr. Mazie Earle Wagner, of the University of Buffalo, working with Eunice Strable, found a correlation of .51 between sophomore English average and the shorthand term average for 115 pupils.[1] Mr. Raymond Worley found a correlation of .707 between marks in Junior High School English and marks in shorthand.[2] The correlation in Dr. Wagner's study is somewhat higher than the correlations in this study, but nothing is known of the relative abilities of the groups nor of the similarities in courses. Mr. Worley's correlation of .521 for marks in Senior High School English and marks in shorthand is almost identical with Dr. Wagner's study. His correlation of .707 between marks in Junior High School English is almost high enough for predictive purposes, but his findings cannot be compared with those of this study, because junior high school marks were not available for the purpose of this study.

The findings of Dr. Wagner's study, Mr. Worley's study of the relationship between Senior High School English and stenography, and this study are essentially

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[1] Op. cit., p. 825
[2] Op. cit., p. 16

the same and indicate a definite positive relationship between English and shorthand, but they also show that, in each of the situations studied, the relationship is not sufficiently high to warrant using teachers' marks in English as predictive of teachers' marks in shorthand.

A further analysis of the data of this study was made to determine whether those pupils who did exceptional work in the English courses also received superior marks in shorthand. Table IX shows the marks of pupils who received a mark of A in English and the marks these pupils made in the four semesters of shorthand.

TABLE IX

A Marks Made by Pupils in English 3 and Marks Of These Pupils in Stenography

| Pupil No. | Mark in Eng.3 | Mark in Sten. 1 | Mark in Sten. 2 | Mark in Sten. 3 | Mark in Sten. 4 |
|---|---|---|---|---|---|
| 5 | 97 | 95 | 96 | 95 | 95 |
| 87 | 95 | 96 | 91 | 96 | 94 |

Table IX shows that the two pupils who made marks of A in English 3 also made high marks in the stenography course. Pupil No. 87, who made a mark of A in English 3, made two marks of A and two of B in the four semesters of shorthand, but her average for the

entire shorthand course was 94.25, just .75 less than her term average in English 3. This would seem to show that pupils who are very successful in the English composition course are also very good in the shorthand course. Unfortunately, the number of cases is too small to have significance.

The marks of pupils who failed in English 3, together with the marks these pupils made in stenography, are shown in Table X.

TABLE X

E Marks Made by Pupils in English 3 and Marks Of These Pupils in Stenography

| Pupil No. | Mark in Eng.3 | Mark in Sten. 1 | Mark in Sten. 2 | Mark in Sten. 3 | Mark in Sten. 4 |
|---|---|---|---|---|---|
| 2 | 68 | 79 | 76 | 77 | 73 |
| 34 | 62 | 78 | 83 | 80 | 86 |
| 55 | 67 | 81 | 82 | 87 | 85 |
| 59 | 65 | 76 | 75 | 76 | 75 |
| 63 | 55 | 81 | 78 | 73 | 82 |
| 65 | 66 | 79 | 74 | 80 | 74 |
| 76 | 68 | 81 | 73 | 72 | 58 |
| 116 | 68 | 76 | 73 | 72 | 70 |
| 117 | 67 | 71 | 72 | 65 | 74 |
| 118 | 63 | 80 | 71 | 73 | 71 |
| 138 | 61 | 66 | 67 | 83 | 77 |
| 198 | 64 | 78 | 74 | 80 | 50 |
| 206 | 64 | 60 | 66 | 81 | 77 |

Of the thirteen pupils in this study who failed in English 3. Table X shows that only five failed in

one or more units of shorthand. To put it a little differently, the thirteen pupils who made failing marks in English composition made only seven failing marks in stenography of a possible fifty-two marks. Of the fifty-two marks possible in stenography for the thirteen failures in English composition, 30 were marks of D, and 15 were marks of C. The evidence offered in Table X seems to show that pupils who fail in English 3 are not necessarily destined to fail in stenography. However, it may be of some significance that no pupil who failed the English 3 course made a mark higher than C in shorthand. It might be safe to assume that a large number of English 3 failures would do more or less unsatisfactory work in stenography, since 37 of the 52 possible marks in shorthand, or approximately 71%, made by these pupils are in the D and E range of marks. It may not be concluded, on the basis of the data in Table X, however, that pupils who fail in English 3 are certain, or even likely, to fail in shorthand. This may be due, as Mr. Worley suggests, to the fact that the English situations covered in the English composition course do not approximate the English situations required in stenography. In the

case of the first two semesters of shorthand, particularly, it may be due to the fact that attention is centered upon mastery of the mechanical features of shorthand and that inadequacies in English ability are not important.

While there is some evidence that pupils outstanding in English 3, as shown by teachers' marks, are also outstanding in stenography, as shown by the same criterion, there is little evidence in this study that pupils who fail in English will fail in stenography.

An analysis of stenography marks for pupils who made A in the English 4, or literature, course was also made. The results are shown in Table XI.

TABLE XI

A Marks Made by Pupils in English 4
And Stenography Marks for the Same Pupils

| Pupil No. | Mark in Eng.4 | Mark in Sten. 1 | Mark in Sten. 2 | Mark in Sten. 3 | Mark in Sten. 4 |
|---|---|---|---|---|---|
| 80 | 95 | 79 | 85 | 87 | 86 |
| 105 | 95 | 87 | 86 | 90 | 84 |
| 121 | 95 | 93 | 93 | 91 | 91 |
| 184 | 95 | 87 | 88 | 85 | 73 |
| 191 | 96 | 95 | 93 | 96 | 96 |

Five pupils made marks of A in the English literature course, as shown in Table XI. Of these five, only

one made an A average in shorthand, one made a B average, and three made averages of C. In two units of shorthand, D marks were made by pupils who had made A in the English 4 course. If these data are compared with the data of Table IV, the findings of the correlation studies seem to be substantiated. There seems to be a somewhat greater relationship between English composition and shorthand than between English literature and shorthand, at least for pupils whose work is very good in English composition. It may be that the English situations of the composition course more nearly approximate the English situations in shorthand than do the English situations in the literature course.

Failures in the English literature course, together with stenography marks made by the same pupils, are shown in Table XII.

TABLE XII

E Marks Made by Pupils in English 4 and Marks Of These Pupils in Stenography

| Pupil No. | Mark in Eng.4 | Mark in Sten. 1 | Mark in Sten. 2 | Mark in Sten. 3 | Mark in Sten. 4 |
|---|---|---|---|---|---|
| 10 | 61 | 81 | 73 | 74 | 60 |
| 95 | 32 | 78 | 76 | 76 | 72 |
| 102 | 53 | 79 | 67 | 68 | 81 |
| 118 | 58 | 80 | 71 | 73 | 71 |
| 144 | 61 | 81 | 91 | 92 | 93 |
| 153 | 52 | 81 | 75 | 85 | 70 |
| 180 | 57 | 79 | 78 | 82 | 67 |
| 202 | 65 | 87 | 88 | 89 | 82 |
| 206 | 63 | 60 | 66 | 81 | 77 |
| 223 | 48 | 76 | 78 | 81 | 74 |

Table XII shows that ten pupils failed in English 4 at Atherton in the years covered by this study. Of these ten, only four failed in stenography. Of a total of 40 marks made in shorthand by the ten pupils, six were E's; 18 were D's; 11 were C's; and 5 were B's. Thirty-five marks, or 87½%, were of C rank or less. Marks of B were made in stenography in five cases, or 12½% of the total. Table XII might be interpreted as showing that pupils who fail in English 4 are likely to receive marks of C or less in stenography, but this seems a doubtful interpretation in view of the fact that marks as high as B were made in stenography by pupils who had failing marks in the English literature course. In general there seems to be a tendency for pupils who fail in English 4 to have scholarship rankings of C or less in stenography.

Analysis of the stenography marks for pupils who made marks of A or E in English 4 lends weight to the evidence offered by the coefficients of correlations between marks of all pupils in this study in English 4 and stenography. The same analysis seems to show a tendency for pupils who make failing marks in English 4 to make marks of C or less in stenography.

No arguments have been set forth as to why ability to type should go along with ability to read and write shorthand, but every stenographer must do both, and many teachers have doubtless found that some of their pupils do well in both subjects. Intense concentration for protracted periods of time and finger dexterity seem to be important factors in both. An effort was made to discover how great this relationship is by correlating teachers' marks in the one semester of typewriting which precedes the election of stenography at Atherton and teachers' marks in stenography. The results are shown in Table IV. All of the correlations between typewriting and stenography recorded in Table IV are too low to justify using Typewriting 1 alone as a predictive measure for stenography. The correlations range from .25 to .40, about the same as correlations between I. Q. and stenography, and slightly less than those between sophomore English and stenography. Mr. Worley, in his study, found that the correlation "between marks in typewriting and in shorthand indicates that marks in typewriting are on a par with those in senior English as a means of predicting success

or failure in shorthand."[1] Essentially the same condition is revealed in this study. Whether these factors are general intelligence factors, covered by the intelligence tests, or whether they are specific factors, such as eye-hand coordination or finger dexterity, it is impossible to determine with the present data and measuring instruments. The findings of this study indicate that a positive relationship exists, but that it is not sufficiently high to justify prediction of marks in shorthand from marks in typewriting.

The marks of A in Typewriting 1 and marks made by the same pupils in stenography are shown in Table XIII.

TABLE XIII

A Marks Made by Pupils in Typing I and Marks Of These Pupils in Stenography

| Pupil No. | Mark in Typ.1 | Mark in Sten. 1 | Mark in Sten. 2 | Mark in Sten. 3 | Mark in Sten. 4 |
|---|---|---|---|---|---|
| 81 | 95 | 86 | 84 | 83 | 80 |
| 82 | 98 | 88 | 88 | 83 | 76 |
| 92 | 95 | 97 | 97 | 95 | 92 |
| 105 | 95 | 87 | 87 | 90 | 84 |
| 106 | 95 | 95 | 95 | 96 | 96 |
| 129 | 96 | 82 | 82 | 91 | 92 |
| 160 | 96 | 85 | 85 | 87 | 89 |
| 179 | 96 | 94 | 94 | 95 | 95 |
| 186 | 96 | 87 | 87 | 85 | 75 |
| 205 | 96 | 97 | 97 | 90 | 85 |
| 131 | 97 | 94 | 94 | 95 | 91 |
| 135 | 95 | 90 | 90 | 88 | 90 |
| 140 | 95 | 88 | 88 | 86 | 83 |

[1] Op. cit., p. 15

Table XIII shows the marks made in stenography by thirteen pupils who made A in Typewriting 1. Of a total of 52 stenography marks for these pupils, 10 were A's, 19 were B's, 20 were C's, and 3 were D's. 29 of the marks, or about 56%, were B or above. About 44% were C or below. This would seem to show that girls who receive marks of A in typewriting are a little more likely to receive marks of A or B in shorthand than they are to receive marks of C or D. No girl who made a mark of A in beginning typewriting failed in stenography. Only three marks as low as D, or approximately 6% of the possible marks in stenography, were made by pupils in this study who made marks of A in typewriting. This seems to offer some help in the matter of guidance, since all pupils who enroll in stenography must offer Typewriting 1 as a prerequisite course. It would seem safe to say that if a girl receives a mark of A in beginning typewriting, the chances are relatively high that she will make average or better than average marks in stenography.

An analysis of marks made in stenography by pupils who received marks of E in beginning typewriting is shown in Table XIV.

TABLE XIV

Marks of E in Typewriting 1 and Stenography Marks Of the Same Pupils

| Pupil No. | Mark in Typ.1 | Mark in Sten. 1 | Mark in Sten. 2 | Mark in Sten. 3 | Mark in Sten. 4 |
|---|---|---|---|---|---|
| 17 | 60 | 67 | 71 | 76 | 70 |
| 26 | 68 | 65 | 78 | 75 | 65 |
| 33 | 65 | 78 | 83 | 80 | 86 |
| 42 | 60 | 79 | 77 | 86 | 86 |
| 67 | 68 | 93 | 91 | 91 | 86 |
| 141 | 49 | 82 | 77 | 80 | 81 |
| 142 | 62 | 79 | 83 | 90 | 90 |
| 155 | 58 | 64 | 74 | 83 | 77 |
| 170 | 61 | 87 | 83 | 83 | 76 |
| 201 | 63 | 66 | 74 | 83 | 77 |

Eleven pupils, of the 225 who enrolled in beginning typewriting during the period of this study, made marks of E as shown in Table XIV. Five of these eleven pupils, approximately 46%, also failed in one or more semesters of stenography. Of the 44 marks they might have received, however, only six are marks of E. Seventeen marks fall into the range of D and 16 into the range of C. Five marks as high as B were made in stenography by pupils who failed in Typewriting 1. The data of Table XIV seem to indicate that failure in beginning typewriting is not a safe index of failure in stenography.

It seems safe to say that pupils who make A in

beginning typewriting may be fairly certain of making marks of C or better in stenography, but it is not possible to say what marks in shorthand will be made by pupils who make failing marks in beginning typewriting. The one exception to this statement lies in the fact that no pupil at Atherton, who failed in beginning typewriting, has made an A in stenography.

Bookkeeping, it its subject matter, has apparently very little in common with shorthand. Nevertheless it precedes shorthand in the curriculum, and the relationship should be examined whether it proves to be highly predictive or not. Of the 225 graduates who completed four semesters of shorthand, 176 elected one term of bookkeeping, and 183 two terms of bookkeeping, before beginning the study of stenography.

The correlations shown in Table IV between teachers' marks in bookkeeping and teachers' marks in stenography are higher, in all cases except the last one, .25±.047, between Bookkeeping 2 and Stenography 4, than those between marks in typewriting and marks in shorthand. It is possible that the kind of finger dexterity that is

useful in bookkeeping is more like that required in shorthand than is the dexterity in machine operation required in typewriting. In three instances--in the relationship between Bookkeeping 1 and Stenography 1 and 2, and in the relationship between Bookkeeping 2 and Stenography 2--they are higher than the correlations found in this study between sophomore English and stenography. Since a great deal of writing is required in both bookkeeping and shorthand, it may be that skill or facility in writing, whether it be numbers of symbols, is one of the factors that contributes to the fairly high relationship found here. Accuracy in writing and copying is essential in both subjects--here may lie another contributing factor. In addition to these specific factors, there may be involved in both certain factors of general intelligence that apply somewhat equally, no matter if the subject be bookkeeping or stenography. It may be, of course, that neither of the specific factors mentioned above is of any importance whatever and that Stenography 2 and bookkeeping are merely both of a certain degree of difficulty, requiring a somewhat similar degree of general intelligence.

It is the opinion of this writer, however, that it will be necessary to dissect these general similarities in order to single out specific abilities which may be tested, if a satisfactory predictive measure for stenography is to be found.

Mr. Worley, in the study referred to previously, found a correlation of .409 between teachers' marks in mathematics and teachers' marks in shorthand.[1] In seven of the eight correlations using Bookkeeping marks and stenography marks in the present study, the relationship was found to be slightly higher. As Mr. Worley does not state what mathematics courses he used in his study, a detailed comparison is not possible.

The relationship of Bookkeeping 1 and 2 to stenography, as revealed by the coefficients of correlation, except in the case of Bookkeeping 2 and Stenography 4, is in general greater than the relationship between stenography marks and I. Q., or between teachers' marks in stenography and teachers' marks in English and in typewriting. Other studies of this relationship should be made to determine whether it holds good in other

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[1] Op. cit. p. 15

situations. The writer did not find such studies in looking over the field of literature on prognosis for stenography.

An analysis, similar to analyses previously discussed for English and typewriting, was made for pupils whose marks in Bookkeeping 1 were A's in order to discover what marks they made in stenography. This analysis is shown in Table XV.

TABLE XV

Marks of A in Bookkeeping 1 and Marks of The Same Pupils in Stenography

| Pupil No. | Mark in Bkkg. 1 | Mark in Sten. 1 | Mark in Sten. 2 | Mark in Sten. 3 | Mark in Sten. 4 |
|---|---|---|---|---|---|
| 5 | 97 | 95 | 96 | 95 | 95 |
| 13 | 97 | 91 | 92 | 91 | 93 |
| 87 | 97 | 96 | 91 | 96 | 94 |
| 92 | 98 | 97 | 96 | 95 | 92 |
| 104 | 96 | 89 | 90 | 89 | 92 |
| 121 | 98 | 93 | 93 | 91 | 91 |
| 127 | 95 | 85 | 90 | 78 | 80 |
| 129 | 95 | 83 | 91 | 92 | 96 |
| 179 | 97 | 94 | 93 | 95 | 95 |
| 191 | 97 | 95 | 93 | 96 | 96 |

Table XV shows that only one pupil, of the ten who made marks of A in beginning bookkeeping, made marks of A in all four semesters of shorthand, but of 40 possible marks in shorthand for these pupils, 15 marks, or 37½%, were A's. Pupils who made A's in

Bookkeeping 1 made 21 B marks in stenography, of a total of 40 marks. Three marks of C and one of D were made in stenography by pupils who received marks of A in Bookkeeping 1. A total of 36 marks of A and B, or 90% of all marks possible, were made in stenography by pupils who made marks of A in beginning bookkeeping. Only ten percent of these pupils made marks of C and D. The data in Table XV seem to show that pupils who make A in Bookkeeping 1 are likely to make marks of A or B in stenography. No pupil who made A in Bookkeeping 1, during the period covered by this study, failed in any unit of stenography.

The analysis of marks in stenography made by pupils who failed in the first semester of bookkeeping is shown in Table XVI.

TABLE XVI

Pupil Marks of E in Bookkeeping 1 and Marks of the Same Pupils in Stenography

| Pupil No. | Mark in Bkkg. 1 | Mark in Sten. 1 | Mark in Sten. 2 | Mark in Sten. 3 | Mark in Sten. 4 |
|---|---|---|---|---|---|
| 10 | 66 | 81 | 73 | 74 | 60 |
| 51 | 67 | 67 | 85 | 71 | 84 |
| 89 | 63 | 80 | 80 | 85 | 82 |
| 102 | 67 | 79 | 67 | 68 | 81 |
| 119 | 67 | 82 | 81 | 87 | 85 |

Inspection of Table XVI reveals the fact that no pupil who failed in Bookkeeping 1 at Atherton, during the period covered by this study, failed in all units of stenography. Of 20 possible marks in stenography, 4 marks of E, 4 marks of D, and 12 marks of C were made by five pupils who received marks of E in Bookkeeping 1. Since 60% of the marks made in stenography by these pupils were in the range of 80 to 87, covered by a mark of C, it seems reasonable to assume that failure in beginning bookkeeping is no criterion for failure in stenography. Pupils who fail in the first bookkeeping unit seem more likely to receive marks of D or C in stenography than they are to make marks of E.

It was shown by coefficients of correlation between bookkeeping and stenography that the relationship between Bookkeeping 2 and stenography, as measured by teachers' marks, was slightly less than the relationship between Bookkeeping 1 and stenography. A further study of this relationship was made by selecting from the raw data of the study the marks of those pupils who made A's in Bookkeeping 2 and setting these down, together with the marks in stenography. The figures are included in Table XVII.

TABLE XVII

Pupil Marks of A in Bookkeeping 2 and Marks Of the Same Pupils in Stenography

| Pupil No. | Mark in Bkkg. 2 | Mark in Sten. 1 | Mark in Sten. 2 | Mark in Sten. 3 | Mark in Sten. 4 |
|---|---|---|---|---|---|
| 5 | 96 | 95 | 96 | 95 | 95 |
| 10 | 95 | 81 | 73 | 74 | 60 |
| 87 | 97 | 96 | 91 | 96 | 94 |
| 92 | 99 | 97 | 96 | 95 | 92 |
| 104 | 95 | 89 | 90 | 89 | 92 |
| 121 | 97 | 93 | 93 | 91 | 91 |
| 150 | 97 | 88 | 93 | 92 | 90 |
| 172 | 96 | 84 | 92 | 92 | 91 |
| 191 | 98 | 95 | 93 | 96 | 96 |
| 197 | 96 | 71 | 78 | 84 | 86 |
| 219 | 95 | 82 | 88 | 81 | 85 |

Table XVII shows the marks of ten pupils who made A's in Bookkeeping 2 and their marks in stenography. Of these ten pupils, one made marks of A in all units of stenography. However, of 44 marks these pupils might have made in stenography, 12 marks were A's. Twenty marks of B were made, 7 marks of C, and 4 marks of D. One girl, whose mark in Bookkeeping 2 was A, made a mark of E in one stenography unit. The 32 marks of A and B in stenography, made by pupils who received marks of A in Bookkeeping 2, constitute 73% of the total number of marks possible for such pupils to make. This percentage should, however, be compared with the 90%

of A and B marks in stenography made by pupils who had received marks of A in Bookkeeping 1. It seems to lend weight to the evidence of the correlation study that marks in Bookkeeping 1 are, in general, more predictive for stenography than are marks in Bookkeeping 2. Since one girl who made A in Bookkeeping 2 failed in stenography, and four who made marks of A in Bookkeeping 2 made marks of D in stenography, it would seem unjustifiable to predict a high degree of success in stenography from marks of A in second-semester bookkeeping, although there is a general tendency for girls who receive marks of A in Bookkeeping 2 to make satisfactory marks in stenography.

Marks of E made by pupils of this study in Bookkeeping 2 are shown in Table XVIII, together with the marks those pupils made in stenography.

TABLE XVIII

Pupil Marks of E in Bookkeeping 2 and Marks Of the Same Pupils in Stenography

| Pupil No. | Mark in Bkkg. 2 | Mark in Sten. 1 | Mark in Sten. 2 | Mark in Sten. 3 | Mark in Sten. 4 |
|---|---|---|---|---|---|
| 1 | 65 | 75 | 77 | 84 | 79 |
| 39 | 64 | 80 | 78 | 75 | 74 |
| 81 | 58 | 86 | 84 | 83 | 80 |
| 83 | 62 | 82 | 77 | 83 | 80 |
| 89 | 54 | 80 | 80 | 85 | 82 |
| 110 | 52 | 72 | 78 | 80 | 76 |
| 116 | 64 | 76 | 73 | 72 | 70 |
| 118 | 68 | 80 | 71 | 73 | 71 |
| 138 | 65 | 66 | 67 | 83 | 77 |
| 141 | 64 | 82 | 77 | 80 | 81 |
| 163 | 64 | 84 | 78 | 80 | 80 |
| 224 | 65 | 83 | 74 | 75 | 81 |

Twelve girls failed in the second semester of Bookkeeping during the period covered by this study, as shown in Table XVIII. None of the twelve failed in all semesters of stenography. Only two marks of E in stenography, or approximately 4% of the possible marks, were made by any pupil who had failed in Bookkeeping 2. Of a total of 48 possible marks, 22 were D's and 24 C's. During the years 1930 through 1935 at Atherton, no pupil who failed in Bookkeeping 2 made a mark higher than C in stenography. Approximately 96% of the marks possible in stenography to pupils who failed second-semester bookkeeping are found to be marks of C and D. This would seem to indicate that failure in Bookkeeping 2, as indicated by teachers' marks, should not be considered a criterion of failure in stenography, as measured by teachers' marks.

In contrast to the situation with regard to the bookkeeping-stenography relationship, the close foreign language-stenography relationship is acknowledged by most people who have studied in both fields. The subject matter is assuredly not the same, but the kinship of language in both seems to be easy to understand.

Of the 225 graudates of Atherton High School whose records are included in this study, 136 elected two semesters of Spanish.

The correlations between first-semester Spanish and the first and second semesters of shorthand, .69±.030, and .70±.030, respectively, shown in Table IV, are the highest single predictive measures found in this study. They are almost high enough to justify the use of teachers' marks in Spanish 1 as predictive measures for the first year of shorthand. Certainly a relationship of .70 between two high school subjects of which the content is quite different must represent a distinct similarity in the kind of performance required for both. All of the correlations between first-semester Spanish and stenography are higher than those found in this study between I. Q. and stenography, between typewriting and stenography, or between English 4 and stenography. The fact that the correlation between Spanish 1 and Stenography 3 drops to .46±.046 may indicate that by the time the more advanced levels of stenography are reached, pupil performance depends more largely upon specific knowledges and skills gained in the two

preceding semesters of stenography than it does upon the learning factors that are common to stenography and Spanish. By the time the second semester of Spanish has been completed, a significant part of the relationship between Spanish and shorthand has been lost. The correlation of .35±.051 between second-semester Spanish and fourth-semester shorthand is about like that found between I. Q. and shorthand. From the data obtained in this study, it would seem that some initial intelligence or ability factor is common to both Spanish and shorthand but that the influence of this factor becomesless and less as the pupil goes into more advanced units of shorthand.

The correlations of .69±.030 and .70±.030 for Spanish and stenography are similar to the relationship Mr. Worley found between modern language, including French, Spanish, and German, and stenography.[1] Mr. Worley found a correlation of .759 between teachers' marks in modern language and teachers' marks in stenography. A better predictive measure might be found by using any one of the languages than by using a combination of the three, but as Mr. Worley does not state how

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[1]Op. Cit., p. 16

he combined the teachers' marks to obtain the correlations for modern language and stenography, it is perhaps presumptuous to attempt to evaluate his findings.

The most significant single relationship found in this study is that between first-semester Spanish and second-semester shorthand. It is the hypothesis of this writer that the relationship is due, not to any similarity in the content of the courses but to the special kind of ability which is useful in both. Sensitivity to auditory stimuli, ability to record these in a medium to which the individual is unaccustomed by previous training, and ability to turn this medium back into the medium natural to the individual, may be factors of this special kind of language intelligence. It would be interesting to try out this hypothesis in a prognostic test, along with other hypotheses suggested by the findings of this study.

An analysis of the stenography marks made by pupils who received marks of A in beginning Spanish is shown in Table XIX.

TABLE XIX

Pupil Marks of A in Spanish 1 and Marks
Of the Same Pupils in Stenography

| Pupil No. | Mark in Span. 1 | Mark in Sten. 1 | Mark in Sten. 2 | Mark in Sten. 3 | Mark in Sten. 4 |
|---|---|---|---|---|---|
| 3 | 95 | 87 | 90 | 90 | 88 |
| 5 | 98 | 95 | 96 | 95 | 95 |
| 33 | 95 | 82 | 80 | 82 | 75 |
| 92 | 99 | 97 | 96 | 95 | 92 |
| 104 | 95 | 89 | 90 | 89 | 92 |
| 124 | 95 | 91 | 92 | 90 | 93 |
| 191 | 96 | 95 | 93 | 96 | 96 |
| 90 | 95 | 86 | 79 | 83 | 87 |

Table XIX shows the stenography marks of eight girls who made marks of A in Spanish at Atherton during the period of this study. One of the eight received marks of A in all four units of stenography. Of the 32 stenography marks these pupils might have made, 10 marks were A's, 13 were B's, 7 were C's, and 2 were D's. No pupil making a mark of A in Spanish 1 failed in any unit of shorthand. Furthermore, 23 marks of A and B in stenography represent approximately 72% of the total marks possible for pupils who made A's in beginning Spanish. Since no pupil at Atherton who made a mark of A in Spanish 1 failed in stenography, and since 72% of the stenography marks possible to pupils who received marks of A in Spanish are in the ranks of

A and B, it seems safe to say that a mark of A in beginning Spanish is a fairly certain index of ability to receive average or better marks in stenography.

Stenography marks of pupils who failed in beginning Spanish and the marks in Spanish for these pupils are shown in Table XX.

TABLE XX

Pupil Marks of E in Spanish 1 and Marks Of the Same Pupils in Stenography

| Pupil No. | Mark in Span. 1 | Mark in Sten. 1 | Mark in Sten. 2 | Mark in Sten. 3 | Mark in Sten. 4 |
|---|---|---|---|---|---|
| 15 | 39 | 51 | 56 | 80 | 71 |
| 17 | 64 | 67 | 71 | 76 | 70 |
| 63 | 67 | 81 | 78 | 73 | 82 |
| 65 | 68 | 79 | 74 | 80 | 74 |
| 97 | 63 | 72 | 70 | 76 | 71 |
| 102 | 62 | 79 | 67 | 68 | 81 |
| 110 | 54 | 72 | 78 | 80 | 76 |
| 116 | 57 | 76 | 73 | 72 | 70 |
| 117 | 61 | 71 | 72 | 65 | 74 |
| 125 | 64 | 75 | 81 | 87 | 82 |
| 133 | 64 | 80 | 79 | 83 | 75 |
| 155 | 68 | 64 | 74 | 83 | 77 |
| 166 | 64 | 80 | 82 | 85 | 81 |
| 190 | 65 | 66 | 79 | 90 | 84 |
| 201 | 65 | 66 | 74 | 83 | 77 |
| 224 | 67 | 83 | 74 | 75 | 81 |

None of the sixteen pupils who failed in Spanish 1, it is shown in Table XX, failed in all four units of stenography. Nine marks, or approximately 28% of the

total of 64 marks possible for these pupils in stenography, were failing marks. Thirty-four marks of D, 20 marks of C, and 1 mark of B were made in stenography by pupils who failed in the first semester of Spanish. This makes a total of 86% passing marks of all possible marks. It would seem that pupils who fail in Spanish 1 are more likely to pass in stenography than they are to fail. Certainly failure in beginning Spanish does not predict failure in stenography.

Stenography marks of pupils who made marks of A in the second semester of Spanish are shown in Table XXI, which also includes marks of A in Spanish 2.

TABLE XXI

Pupil Marks of A in Spanish 2 and Marks Of the Same Pupils in Stenography

| Pupil No. | Mark in Span. 2 | Mark in Sten. 1 | Mark in Sten. 2 | Mark in Sten. 3 | Mark in Sten. 4 |
|---|---|---|---|---|---|
| 5 | 97 | 95 | 96 | 95 | 95 |
| 121 | 95 | 93 | 93 | 91 | 91 |
| 131 | 97 | 94 | 92 | 95 | 91 |
| 179 | 95 | 94 | 93 | 95 | 95 |
| 191 | 97 | 95 | 93 | 96 | 96 |
| 205 | 95 | 97 | 92 | 90 | 85 |

Inspection of Table XXI shows that six pupils, whose records are included in this study, made marks

of A in Spanish 2. One of these pupils made a mark of A in all semesters of stenography. Of the 24 marks these girls might have made in shorthand, 11 are marks of A, 12 are marks of B, and 1 is a mark of C. The marks of A and B represent a total of 96% of all stenography marks possible for pupils who made A in Spanish 2. This would seem to make warrantable the prediction that pupils who make marks of A in the second semester of Spanish are likely to make marks of A or B in stenography. As was the case with pupils who made marks of A in Spanish 1, no pupil has failed in stenography at Atherton, who made a mark of A in second-semester Spanish.

The pupil marks of E in Spanish 2 and stenography marks for pupils who received marks of E in Spanish 2 are shown in Table XXII.

TABLE XXII

Pupil Marks of E in Spanish 2 and Marks Of the Same Pupils in Stenography

| Pupil No. | Mark in Span. 2 | Mark in Sten. 1 | Mark in Sten. 2 | Mark in Sten. 3 | Mark in Sten. 4 |
|---|---|---|---|---|---|
| 19 | 68 | 84 | 79 | 80 | 81 |
| 31 | 68 | 89 | 83 | 70 | 87 |
| 41 | 24 | 79 | 80 | 77 | 70 |
| 48 | 64 | 76 | 75 | 85 | 85 |
| 57 | 68 | 76 | 78 | 55 | 81 |
| 59 | 51 | 76 | 75 | 76 | 75 |
| 60 | 53 | 71 | 74 | 80 | 73 |
| 102 | 66 | 79 | 67 | 68 | 81 |
| 110 | 53 | 72 | 78 | 80 | 76 |
| 116 | 61 | 76 | 73 | 72 | 70 |
| 122 | 46 | 74 | 75 | 80 | 73 |
| 132 | 48 | 84 | 87 | 77 | 79 |
| 141 | 57 | 82 | 77 | 80 | 81 |
| 161 | 64 | 71 | 78 | 73 | 77 |
| 163 | 49 | 84 | 78 | 80 | 80 |
| 193 | 57 | 80 | 86 | 87 | 84 |
| 198 | 55 | 78 | 74 | 80 | 50 |
| 210 | 67 | 84 | 81 | 78 | 76 |

None of the eighteen girls who failed in Spanish 2, as shown in Table XXII, failed all units of stenography. Four marks of E were made in stenography by these pupils, 39 marks of D, 28 marks of C, and 1 mark of B. Approximately 96% of the marks these pupils might have made in stenography are passing marks. Apparently failure in second-semester Spanish, like

failure in first-semester Spanish, is no certain criterion of failure in stenography.

The findings of this chapter with regard to the predictive value of sophomore English, bookkeeping, typewriting, and Spanish for stenography are shown below. In reporting the comparisons between high and low marks, the writer is merely setting down facts as they appear in the school records--these comparisons do not have the weight nor accuracy of the correlation coefficients.

(1) Coefficients of correlation between teachers' marks in the English 3, or composition course, at Atherton High School, and teachers' marks in the four semester units of stenography range between .32, with a probable error of ±.040, and .46, with a probable error of ±.036. These correlations indicate a positive, but not significant relationship between teachers' marks in the two subjects.

Pupils who made marks of A in the English 3 course also made marks of A in all units of stenography.

Approximately 87% of the stenography marks of pupils who failed in the English 3 course are marks of D or C.

(2) Coefficients of correlation between teachers' marks in the English 4, or literature course, and teachers' marks in stenography range between .34, with a probable error of ±.039, and .40, with a probable error of ±.038. These correlations are slightly, but not significantly lower than the correlations found to exist between teachers' marks in English 3 and teachers' marks in stenography. They also indicate a positive, but not significant relationship.

No pupil who received a mark of A in English 4 failed in stenography.

85% of the pupils who failed the English 4 course made passing marks in all units of stenography.

(3) Coefficients of correlation between teachers' marks in beginning typewriting and teachers' marks in stenography range between .25, with a probable error of ±.042, and .40, with a probable error of ±.038. These correlations are slightly

less than the correlations found to exist between teachers' marks in English 3 and 4 and teachers' marks in stenography.

Analysis of marks in stenography for pupils who receive marks of A in beginning typewriting shows that such pupils have made passing marks in all units of stenography.

86% of the marks made in stenography by pupils who failed in Typewriting 1 are passing marks.

(4) Coefficients of correlation between teachers' marks in the beginning course in bookkeeping and teachers' marks in stenography range from .41, with a probable error of ±.042, to .57, with a probable error of ±.034. These correlations are higher than those between teachers' marks in sophomore English or teachers' marks in beginning typewriting and teachers' marks in stenography.

Marks of A and B constitute 90% of all marks made in stenography by pupils who made A in Bookkeeping 1.

Marks of C and D constitute 75% of all marks possible for pupils who fail in first-semester bookkeeping.

(5) Coefficients of correlation between teachers' marks in the second semester of bookkeeping and teachers' marks in stenography range between .25, with a probable error of ± .047, and .52, with a probable error of ± .036. The highest correlation is greater than any of the correlations between teachers' marks in sophomore English or teachers' marks in beginning typewriting and teachers' marks in stenography.

73% of the stenography marks possible for pupils who made A in Bookkeeping 2 are marks of A and B. One pupil who made A in Bookkeeping 2 failed in the fourth semester of shorthand.

Approximately 96% of all stenography marks made by pupils who failed in Bookkeeping 2 are marks of C or less.

(6) Coefficients of correlation between teachers' marks in the first semester of Spanish and teachers' marks in stenography range between .46, with a probable error of ±.046, and .70, with a probable error of ±.030. Two of the correlations, .69±.030 between teachers' marks in Spanish 1 and teachers' marks in Stenography 1, and .70±.030 between teachers' marks in Spanish 1 and teachers' marks in Stenography 2, are the most significant single predictive measures found in this study.

72% of the stenography marks possible for girls who received marks of A in Spanish 1 are marks of A and B.

Of the stenography marks that might be made by girls who failed in Spanish 1, 86% are passing marks.

(7) Coefficients of correlation between teachers' marks in the second semester of Spanish and teachers' marks in stenography range from .35, with a probable error of ±.051, to .43, with a probable error of ±.047. These correlations are comparable to correlations between teachers' marks in English and typewriting and teachers' marks in stenography.

96% of all stenography marks made by pupils who received marks of A in Spanish 2 are marks of A and B.

Approximately 96% of all stenography marks made by pupils who failed the Spanish 2 course are marks of D or better.

(8) Each of the measures used has a slightly higher value for predicting the averages of marks received in the entire stenography course than any single measure has for predicting the marks of a given semester's work.

# CHAPTER IV

## THE VALUE OF COMBINED MEASURES FOR PREDICTING SUCCESS IN STENOGRAPHY

The extent to which degree of success in each of the four semesters of stenography is identical was analyzed by the use of the partial correlation technique. By making use of the zero order coeefficients of correlation among the stenography variables of the sutdy, partial coefficients were determined for these variables by the basic formulas.[1] The partial correlation coefficients are shown in Table XXIII.

TABLE XXIII

Partial Correlation Coefficients Computed From Zero Order Coefficients for Teachers' Marks In Stenography at Atherton High School 1930-1935

(Variable=1 marks in Stenography 1; Variable=2 marks in Stenography 2; etc.)

| Variables | Partial Correlation Coefficients |
|---|---|
| $r_{12.34}$ | .472±.035 |
| $r_{13.24}$ | .154±.043 |
| $r_{14.23}$ | .124±.044 |
| $r_{23.14}$ | .213±.042 |
| $r_{24.13}$ | .200±.043 |
| $r_{34.12}$ | .317±.039 |

Table XXIII should be read across, thus: The relationship between success in stenography 1 and Stenography 2, exclusive or independent of success in Stenography 3 and Stenography 4 is represented by a correlation coefficient of .472--the Probable Error of this coefficient is ±.035.

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[1] Dunlap and Kurtz, A. L.: Handbook of Statistical Nomographs, Tables and Formulas, Formulas 310 and 311

Since the partial correlation coefficient representing the relationship between Stenography 1 and Stenography 2, exclusive of Stenography 3 and Stenography 4, is, as shown in Table XXIII, sufficiently high to be more than thirteen times its probable error above zero, it may be said that success in the first two semesters of stenography at Atherton High School is dependent upon factors which bear no relationship to degree of success in the third and fourth semesters. What these factors are is, of course, not revealed by the correlations themselves.

The other partial correlation coefficients should be interpreted in a manner identical with that given above. Attention should be called to the fact that common factors operate to produce success in Stenography 3 and Stenography 4, as well as in Stenography 1 and 2. No other significant unique relationship is indicated in the coefficients of correlation of Table XXIII. In other words, success in the stenography courses at Atherton High School is due largely to common elements operating throughout the four semesters. Some unique factors

operate to determine success in Stenography 1 and 2 and in Stenography 3 and 4, but it is not possible to determine the exact nature of these factors from the data of this study. It seems to the writer that these factors are inherent in the courses rather than that they are due to idiosyncrasies of the teachers' marks. This belief is substantiated by the fact that while the same three teachers have taught all of the stenography courses at Atherton High School during the thirteen semesters covered by the study, the same teacher has never been consistently assigned to teach any particular semester unit. The writer has, during this period, taught some classes in each unit.

Multiple correlation coefficients, showing the value of certain combined measures for predicting teachers' marks in each semester unit of stenography were computed by the usual formula.[1] The results are shown in Table XXIV.

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[1] Dunlap, J. W., and Kurtz, A. K.: Handbook of Statistical Nomographs, Tables, and Formulas, Formula 321

TABLE XXIV

Multiple Correlation Coefficients Computed From Zero Order Coefficients Between Marks In Certain Combined Measures and Teachers' Marks In Stenography at Atherton High School (1930-1935)

| Combined Measures | Sten. 1 $R_{1.23}$ | Sten. 2 $R_{1.23}$ | Sten. 3 $R_{1.23}$ | Sten. 4 $R_{1.23}$ | No. Cases |
|---|---|---|---|---|---|
| I. Q.--English 3 | .37±.039 | .41±.037 | .40±.038 | .41±.037 | 225 |
| I. Q.--English 4 | .41±.037 | .35±.039 | .38±.039 | .37±.039 | 225 |
| Eng.3--Eng. 4 | .41±.037 | .47±.035 | .44±.036 | .46±.035 | 225 |
| Bkkg. 1--Bkkg. 2 | .52±.036 | .45±.041 | .37±.044 | .31±.046 | 170 |
| Span. 1--Span. 2 | .70±.030 | .64±.034 | .46±.046 | .46±.046 | 150 |
| Sten. 1--Sten. 2 | | | .43±.036 | .54±.032 | 225 |
| Sten. 1--Sten. 3 | | | | .53±.032 | 225 |
| Sten. 2--Sten. 3 | | | | .61±.028 | 225 |

This table should be read across, thus: The value of teachers' marks in English 3 and the I. Q. for predicting success in Stenography 1 is represented by a coefficient of multiple correlation of .37--the Probable Error is ± .039; the value of the I. Q. and teachers' marks in English 3 for predicting success in Stenography 2 is represented by a coefficient of multiple correlation coefficient of .41--the Probable Error is ± .037; etc.

The range of coefficients of multiple correlation, shown in Table XXIV, does not differ greatly from the range of zero order correlations shown in Table IV. Little would be added for the purpose of guidance in combining the I. Q. rating with marks in English 3 or English Four or by combining the Bookkeeping, Spanish, or Stenography marks.

# CHAPTER V

# CONCLUSION

Data were secured from the permanent files at Atherton High School for 225 graduates who had completed the stenography course during the years 1930 to 1935. From these data the influence of certain measures upon the degrees of success in stenography, as measured by teachers' marks, was determined. The predictive measures used were: I. Q. rating, teachers' marks in English, typewriting, bookkeeping, and Spanish courses preceding election of stenography. These measures were related by correlation technique and by the use of tables to degrees of success in each of the four semester units of stenography and in the four-semester average of stenography.

The findings, in general, are much like the findings of studies previously reported in the literature. They may be summarized as follows:

(1) The I. Q. rating is not a satisfactory index of pupil success in stenography, as shown by teachers' marks. For pupils whose I. Q. ratings are 110 or higher, the I. Q. has a significantly higher predictive value than it has for all pupils. The performance of bright pupils is more consistent through the four semesters of stenography than is the performance of the entire group.

(2) Despite the apparent relationship between English and stenography, teachers' marks in the sophomore course in English at Atherton High School do not show a sufficiently high relationship with teachers' marks in stenography to warrant using them as measures predictive of degrees of success in stenography.

(3) Marks in typewriting have a definite positive relationship with marks in stenography, but this relationship is not sufficiently high to indicate its use in prediction.

(4) Teachers' marks in the first semester of bookkeeping have a higher positive relationship with teachers' marks in the first two semesters of stenography than have the I. Q. rating or teachers' marks in Sophomore English and beginning typewriting.

(5) Teachers' marks in the first two semesters of Spanish bear the highest relationship found in this study with teachers' marks in the first two semesters of stenography.

(6) The best measures found in this study for predicting success in Stenography 3 and 4 are marks in Stenography 2 and 3, respectively.

(7) There seems to be a trend indicated for girls who make marks of A in English, beginning Typewriting, the first two semesters of bookkeeping, and the first two semesters of Spanish to earn satisfactory marks in stenography.

(8) Girls who have received failing marks in certain subjects preceding stenography have not invariably failed in stenography.

(9) All of the measures considered have a slightly higher predictive value for the four-semester stenography average than they have for any of the single-semester averages.

(10) On the basis of the partial correlations calculated, it may be said that specific factors operate to produce success in Stenography 1 and Stenography 2, and in Stenography 3 and 4.

(11) Combining various measures used in the study by multiple correlation technique gives a somewhat better predictive measure than using the single measures.

Further and more extensive studies should be made in this field to bring about an adequate guidance program for pupils who wish to elect the stenography course. An attempt should be made to discover what predictive value for stenography may lie in junior high school records; to dis-

cover the significance of the total sophomore average as an index of success in stenography; to discover the significance of teachers' marks in high school subjects, other than those included in this study, for prediction of marks in stenography.

Finally, if the stenography course is to continue to be largely vocational in aim, studies should be made to discover the relationship between school success and business success to bring about more adequate guidance into the stenography classes in the schools and better preparation and guidance for future employment.

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# APPENDIX

RAW DATA

I. Q. AND TEACHERS' MARKS, AS INDICATED,

FOR 225 GRADUATES OF J. M. ATHERTON HIGH SCHOOL

| Pupil | Eng 3 | Eng 4 | Steno 1 | Steno 2 | Steno 3 | Steno 4 | Typ 1 | Bkkg 1 | Bkkg 2 | Span 1 | Span 2 | I.Q. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 73 | 85 | 75 | 77 | 84 | 79 | 85 | 71 | 65 | 80 | 82 | 104 |
| 2 | 68 | 90 | 79 | 76 | 77 | 73 | 84 | 79 | 88 | -- | -- | 98 |
| 3 | 78 | 86 | 87 | 90 | 90 | 88 | 83 | 93 | 94 | 95 | 92 | 101 |
| 4 | 81 | 80 | 84 | 84 | 81 | 87 | 84 | 79 | 84 | 83 | 83 | 106 |
| 5 | 97 | 90 | 95 | 96 | 95 | 95 | 88 | 97 | 96 | 98 | 97 | 106 |
| 6 | 81 | 75 | 83 | 79 | 88 | 76 | 81 | 85 | 86 | 75 | 80 | 88 |
| 7 | 79 | 77 | 75 | 80 | 82 | 84 | 88 | 84 | 75 | 90 | 81 | 104 |
| 8 | 91 | 91 | 88 | 89 | 89 | 77 | 88 | 88 | 83 | 87 | 91 | 113 |
| 9 | 83 | 70 | 83 | 78 | 71 | 74 | 99 | -- | -- | -- | -- | 104 |
| 10 | 76 | 61 | 81 | 73 | 74 | 60 | 90 | 66 | 95 | 77 | 70 | 102 |
| 11 | 87 | 86 | 87 | 85 | 85 | 88 | 80 | 79 | 70 | -- | -- | 107 |
| 12 | 86 | 79 | 89 | 87 | 90 | 87 | 93 | 87 | 91 | 88 | 84 | 113 |
| 13 | 89 | 86 | 91 | 92 | 91 | 93 | 83 | 97 | 93 | 93 | 92 | 113 |
| 14 | 74 | 77 | 71 | 74 | 79 | 84 | 90 | 83 | 78 | -- | -- | 100 |
| 15 | 74 | 84 | 51 | 56 | 80 | 71 | 76 | 73 | 70 | 39 | -- | 93 |
| 16 | 86 | 82 | 88 | 81 | 79 | 81 | 90 | 85 | 84 | 81 | 81 | 96 |
| 17 | 71 | 73 | 67 | 71 | 76 | 70 | 60 | 81 | 71 | 64 | -- | 97 |
| 18 | 78 | 70 | 60 | 63 | 85 | 76 | 72 | 80 | 84 | -- | -- | 96 |
| 19 | 90 | 89 | 84 | 79 | 80 | 81 | 74 | 75 | 70 | 71 | 68 | 113 |
| 20 | 82 | 84 | 88 | 86 | 79 | 73 | 92 | 89 | 93 | 87 | 93 | 101 |
| 21 | 77 | 87 | 85 | 83 | 76 | 75 | 83 | 86 | 72 | 87 | 83 | 93 |
| 22 | 76 | 85 | 86 | 84 | 85 | 85 | 85 | 83 | 86 | 80 | 70 | 99 |

| Pupil | Eng 3 | Eng 4 | Steno 1 | Steno 2 | Steno 3 | Steno 4 | Typ 1 | Bkkg 1 | Bkkg 2 | Span 1 | Span 2 | I.Q. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 23 | 73 | 89 | 72 | 78 | 86 | 84 | 79 | -- | -- | -- | -- | 94 |
| 24 | 81 | 80 | 93 | 85 | 91 | 84 | 87 | -- | -- | -- | -- | 102 |
| 25 | 90 | 87 | 92 | 93 | 92 | 90 | 83 | 85 | 79 | -- | -- | 105 |
| 26 | 70 | 85 | 85 | 79 | 84 | 77 | 81 | 78 | 84 | -- | -- | 105 |
| 27 | 78 | 80 | 65 | 78 | 75 | 65 | 68 | 75 | 79 | 73 | 80 | 96 |
| 28 | 80 | 76 | 89 | 88 | 80 | 82 | 86 | -- | -- | -- | -- | 99 |
| 29 | 81 | 76 | 75 | 75 | 69 | 79 | 84 | 90 | 81 | -- | -- | 103 |
| 30 | 74 | 71 | 84 | 86 | 87 | 80 | 74 | 85 | 83 | -- | -- | 106 |
| 31 | 78 | 76 | 89 | 83 | 70 | 87 | 90 | 72 | 70 | 75 | 68 | 104 |
| 32 | 77 | 77 | 79 | 87 | 78 | 84 | 73 | 86 | 71 | 76 | 75 | 107 |
| 33 | 88 | 87 | 82 | 80 | 82 | 75 | 80 | 80 | 86 | 95 | 84 | 101 |
| 34 | 62 | 71 | 78 | 83 | 80 | 86 | 65 | -- | -- | -- | -- | 89 |
| 35 | 85 | 78 | 83 | 81 | 78 | 85 | 80 | 86 | 85 | 81 | 93 | 89 |
| 36 | 76 | 83 | 75 | 74 | 77 | 64 | 80 | 77 | 73 | -- | -- | 108 |
| 37 | 84 | 84 | 82 | 84 | 78 | 80 | 87 | -- | -- | -- | -- | 99 |
| 38 | 85 | 81 | 75 | 90 | 89 | 76 | 72 | 75 | 71 | -- | -- | 99 |
| 39 | 73 | 74 | 80 | 78 | 75 | 74 | 76 | 80 | 64 | -- | -- | 104 |
| 40 | 73 | 75 | 79 | 79 | 78 | 83 | 77 | 72 | 74 | -- | -- | 112 |
| 41 | 77 | 70 | 79 | 80 | 77 | 70 | 81 | 84 | 84 | 72 | 24 | 92 |
| 42 | 79 | 87 | 79 | 77 | 86 | 86 | 60 | 82 | 73 | 89 | 89 | 93 |
| 43 | 73 | 90 | 86 | 81 | 79 | 81 | 85 | 91 | 82 | -- | -- | 108 |
| 44 | 74 | 86 | 77 | 79 | 76 | 70 | 72 | 86 | 77 | 83 | 75 | 109 |

| Pupil | Eng 3 | Eng 4 | Steno 1 | Steno 2 | Steno 3 | Steno 4 | Typ 1 | Bkkg 1 | Bkkg 2 | Span 1 | Span 2 | I.Q. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 45 | 83 | 76 | 90 | 83 | 88 | 76 | 92 | 93 | 91 | 90 | 89 | 104 |
| 46 | 83 | 76 | 77 | 76 | 84 | 76 | 80 | 76 | 72 | -- | -- | 101 |
| 47 | 75 | 75 | 80 | 81 | 86 | 88 | 81 | 80 | 71 | -- | -- | 98 |
| 48 | 79 | 87 | 76 | 75 | 85 | 85 | 72 | 74 | 79 | 75 | 64 | 100 |
| 49 | 90 | 92 | 77 | 83 | 92 | 81 | 82 | 86 | 81 | -- | -- | 108 |
| 50 | 83 | 88 | 85 | 87 | 81 | 85 | 87 | 91 | 92 | 85 | 82 | 101 |
| 51 | 75 | 81 | 67 | 85 | 71 | 84 | 93 | 67 | 74 | -- | -- | 105 |
| 52 | 77 | 79 | 88 | 84 | 90 | 88 | 73 | 73 | 81 | -- | -- | 106 |
| 53 | 84 | 92 | 76 | 81 | 88 | 83 | 85 | 84 | 89 | 84 | 79 | 112 |
| 54 | 81 | 81 | 83 | 87 | 85 | 82 | 91 | 80 | 80 | -- | -- | 100 |
| 55 | 67 | 75 | 81 | 82 | 87 | 85 | 85 | 89 | 85 | 81 | 76 | 97 |
| 56 | 84 | 79 | 77 | 84 | 73 | 86 | 72 | -- | -- | 89 | 82 | 112 |
| 57 | 76 | 80 | 76 | 78 | 55 | 81 | 77 | 86 | 83 | 71 | 68 | 104 |
| 58 | 73 | 71 | 83 | 79 | 73 | 78 | 86 | 83 | 77 | -- | -- | 91 |
| 59 | 65 | 78 | 76 | 75 | 76 | 75 | 74 | 72 | 71 | 82 | 51 | 100 |
| 60 | 74 | 74 | 71 | 74 | 80 | 73 | 78 | 88 | 79 | 80 | 53 | 91 |
| 61 | 83 | 83 | 89 | 86 | 85 | 84 | 90 | 72 | 75 | 86 | 74 | 110 |
| 62 | 71 | 74 | 77 | 83 | 73 | 82 | 76 | -- | -- | 80 | 81 | 106 |
| 63 | 55 | 77 | 81 | 78 | 73 | 82 | 78 | 84 | 77 | 67 | 78 | 103 |
| 64 | 78 | 86 | 90 | 87 | 88 | 85 | 91 | 84 | 92 | 83 | 77 | 106 |
| 65 | 66 | 70 | 79 | 74 | 80 | 74 | 74 | 74 | 76 | 68 | 81 | 95 |
| 66 | 90 | 80 | 77 | 79 | 70 | 83 | 73 | -- | -- | -- | -- | 98 |

| Pupil | Eng 3 | Eng 4 | Steno 1 | Steno 2 | Steno 3 | Steno 4 | Typ 1 | Bkkg 1 | Bkkg 2 | Span 1 | Span 2 | I.Q. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 67 | 79 | 87 | 93 | 91 | 91 | 86 | 68 | 89 | 89 | 84 | 78 | 113 |
| 68 | 90 | 85 | 93 | 92 | 97 | 88 | 90 | -- | -- | -- | -- | 107 |
| 69 | 90 | 91 | 81 | 88 | 80 | 78 | 78 | 80 | 87 | -- | -- | 104 |
| 70 | 85 | 84 | 79 | 78 | 67 | 82 | 85 | 89 | 79 | 85 | 87 | 107 |
| 71 | 81 | 85 | 79 | 78 | 77 | 73 | 77 | 74 | 85 | 84 | 85 | 106 |
| 72 | 91 | 87 | 88 | 89 | 91 | 91 | 81 | -- | -- | 88 | 90 | 120 |
| 73 | 74 | 79 | 75 | 72 | 70 | 81 | 81 | 72 | 71 | -- | -- | 102 |
| 74 | 74 | 81 | 76 | 84 | 64 | 80 | 79 | 77 | 72 | 72 | 86 | 95 |
| 75 | 92 | 83 | 82 | 89 | 88 | 87 | 83 | 88 | 88 | -- | -- | 102 |
| 76 | 68 | 79 | 81 | 73 | 72 | 58 | 60 | 81 | 80 | -- | -- | 92 |
| 77 | 85 | 87 | 94 | 88 | 83 | 79 | 85 | 90 | 89 | 87 | 94 | 103 |
| 78 | 88 | 86 | 87 | 83 | 72 | 85 | 88 | 82 | 73 | 80 | 70 | 109 |
| 79 | 91 | 90 | 86 | 86 | 84 | 81 | 80 | -- | -- | -- | -- | 113 |
| 80 | 77 | 95 | 79 | 85 | 87 | 86 | 87 | -- | -- | -- | -- | 113 |
| 81 | 78 | 82 | 86 | 84 | 83 | 80 | 95 | 82 | 58 | -- | -- | 100 |
| 82 | 70 | 77 | 88 | 83 | 83 | 76 | 98 | 81 | 76 | 75 | 84 | 99 |
| 83 | 75 | 81 | 82 | 77 | 83 | 80 | 91 | 81 | 62 | -- | -- | 80 |
| 84 | 79 | 89 | 82 | 87 | 86 | 77 | 71 | -- | 92 | 91 | 88 | 120 |
| 85 | 88 | 94 | 88 | 88 | 91 | 90 | 80 | -- | -- | -- | -- | 106 |
| 86 | 87 | 86 | 88 | 89 | 92 | 93 | 88 | 87 | 87 | 86 | 87 | 114 |
| 87 | 95 | 87 | 96 | 91 | 96 | 94 | 94 | 97 | 97 | -- | -- | 120 |
| 88 | 78 | 83 | 91 | 91 | 83 | 84 | 90 | 92 | 81 | 80 | 82 | 106 |

| Pupil | Eng 3 | Eng 4 | Steno 1 | Steno 2 | Steno 3 | Steno 4 | Typ 1 | Bkkg 1 | Bkkg 2 | Span 1 | Span 2 | I.Q. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 89 | 80 | 72 | 80 | 80 | 85 | 82 | 73 | 63 | 54 | 78 | 77 | 86 |
| 90 | 91 | 87 | 86 | 79 | 83 | 87 | 72 | -- | -- | 95 | 92 | 112 |
| 91 | 70 | 73 | 70 | 81 | 83 | 75 | 83 | 87 | 79 | 79 | 78 | 92 |
| 92 | 91 | 93 | 97 | 96 | 95 | 92 | 95 | 98 | 99 | 93 | 94 | 118 |
| 93 | 80 | 81 | 75 | 83 | 85 | 89 | 80 | -- | -- | -- | -- | 86 |
| 94 | 85 | 86 | 72 | 75 | 79 | 80 | 88 | -- | -- | -- | -- | 116 |
| 95 | 76 | 32 | 78 | 76 | 76 | 72 | 82 | 73 | 70 | -- | -- | 100 |
| 96 | 72 | 75 | 91 | 91 | 87 | 89 | 89 | -- | -- | -- | -- | 110 |
| 97 | 82 | 71 | 72 | 70 | 76 | 71 | 73 | 71 | 70 | 63 | 70 | 97 |
| 98 | 82 | 72 | 87 | 80 | 82 | 77 | 77 | 77 | 72 | -- | -- | 103 |
| 99 | 83 | 89 | 86 | 84 | 86 | 86 | 85 | -- | -- | 93 | 90 | 110 |
| 100 | 81 | 83 | 85 | 83 | 84 | 80 | 75 | 87 | 91 | 90 | 82 | 107 |
| 101 | 80 | 83 | 90 | 80 | 80 | 75 | 84 | 73 | 77 | 83 | 78 | 108 |
| 102 | 73 | 53 | 79 | 67 | 68 | 81 | 81 | 67 | 83 | 62 | 66 | 91 |
| 103 | 87 | 89 | 89 | 82 | 90 | 87 | 86 | 84 | 77 | -- | -- | 101 |
| 104 | 91 | 88 | 89 | 90 | 89 | 92 | 83 | 96 | 95 | -- | -- | 112 |
| 105 | 84 | 95 | 87 | 86 | 90 | 84 | 95 | 84 | 90 | 85 | 86 | 111 |
| 106 | 92 | 94 | 95 | 93 | 96 | 96 | 95 | -- | -- | -- | -- | 124 |
| 107 | 89 | 85 | 92 | 90 | 90 | 91 | 86 | -- | -- | -- | -- | 109 |
| 108 | 89 | 93 | 91 | 90 | 87 | 85 | 82 | -- | -- | -- | -- | 123 |
| 109 | 86 | 78 | 85 | 95 | 98 | 89 | 87 | 85 | 92 | -- | -- | 93 |
| 110 | 73 | 70 | 72 | 78 | 80 | 76 | 84 | 72 | 52 | 54 | 53 | 89 |

| Pupil | Eng 3 | Eng 4 | Steno 1 | Steno 2 | Steno 3 | Steno 4 | Typ 1 | Bkkg 1 | Bkkg 2 | Span 1 | Span 2 | I.Q. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 111 | 88 | 78 | 85 | 87 | 85 | 88 | 85 | 85 | 86 | 87 | 85 | 107 |
| 112 | 77 | 79 | 74 | 74 | 81 | 78 | 77 | 77 | 78 | -- | -- | 101 |
| 113 | 79 | 78 | 89 | 90 | 87 | 80 | 92 | 82 | 89 | 80 | 80 | 103 |
| 114 | 76 | 86 | 84 | 86 | 87 | 81 | 84 | 92 | 79 | 81 | 79 | 109 |
| 115 | 75 | 83 | 80 | 80 | 82 | 82 | 86 | 82 | 82 | 83 | 87 | 94 |
| 116 | 68 | 80 | 76 | 73 | 72 | 70 | 76 | 72 | 64 | 57 | 61 | 107 |
| 117 | 67 | 78 | 71 | 72 | 65 | 74 | 94 | 74 | 78 | 61 | 79 | 94 |
| 118 | 63 | 58 | 80 | 71 | 73 | 71 | 83 | 78 | 68 | 73 | 73 | 83 |
| 119 | 85 | 80 | 82 | 81 | 87 | 85 | 81 | 67 | 77 | 86 | 78 | 101 |
| 120 | 77 | 78 | 82 | 85 | 84 | 77 | 82 | 90 | 85 | 81 | 74 | 105 |
| 121 | 90 | 95 | 93 | 93 | 91 | 91 | 92 | 98 | 97 | 93 | 95 | 123 |
| 122 | 75 | 73 | 74 | 75 | 80 | 73 | 91 | -- | 75 | 72 | 46 | 109 |
| 123 | 70 | 84 | 80 | 79 | 86 | 72 | 78 | 82 | 84 | 80 | 78 | 102 |
| 124 | 88 | 91 | 91 | 91 | 92 | 90 | 93 | 86 | 94 | 89 | 95 | 113 |
| 125 | 75 | 70 | 75 | 81 | 87 | 82 | 78 | -- | 75 | 64 | 72 | 86 |
| 126 | 83 | 75 | 93 | 85 | 87 | 80 | 74 | -- | -- | -- | -- | 105 |
| 127 | 88 | 90 | 85 | 90 | 78 | 80 | 91 | 95 | 89 | 90 | 87 | 116 |
| 128 | 81 | 70 | 75 | 84 | 68 | 82 | 79 | 85 | 83 | 90 | 77 | 90 |
| 129 | 87 | 82 | 83 | 91 | 92 | 96 | 94 | 95 | 91 | 89 | 87 | 112 |
| 130 | 84 | 89 | 97 | 93 | 92 | 81 | 78 | 89 | 92 | 93 | 93 | 109 |
| 131 | 88 | 92 | 94 | 92 | 95 | 91 | 97 | 91 | 94 | 94 | 97 | 107 |
| 132 | 81 | 82 | 84 | 87 | 77 | 79 | 89 | 88 | 76 | 76 | 48 | 101 |

| Pupil | Eng 3 | Eng 4 | Steno 1 | Steno 2 | Steno 3 | Steno 4 | Typ 1 | Bkkg 1 | Bkkg 2 | Span 1 | Span 2 | I.Q. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 133 | 70 | 70 | 80 | 79 | 83 | 75 | 78 | 80 | 73 | 64 | 74 | 100 |
| 134 | 86 | 83 | 95 | 92 | 96 | 91 | 87 | 92 | 85 | -- | -- | 120 |
| 135 | 92 | 88 | 90 | 88 | 88 | 90 | 95 | 94 | 92 | -- | -- | 110 |
| 136 | 76 | 80 | 78 | 77 | 81 | 82 | 79 | 75 | 78 | -- | -- | 105 |
| 137 | 76 | 74 | 84 | 85 | 86 | 81 | 81 | 87 | 80 | 83 | 75 | 112 |
| 138 | 61 | 77 | 66 | 67 | 83 | 77 | 72 | 70 | 65 | -- | -- | 104 |
| 139 | 90 | 90 | 78 | 81 | 88 | 88 | 73 | -- | -- | -- | -- | 114 |
| 140 | 86 | 84 | 88 | 84 | 86 | 83 | 95 | -- | -- | -- | -- | 98 |
| 141 | 74 | 85 | 82 | 77 | 80 | 81 | 49 | 70 | 64 | 79 | 57 | 85 |
| 142 | 86 | 70 | 79 | 83 | 90 | 90 | 62 | 81 | 82 | 83 | 80 | 101 |
| 143 | 92 | 88 | 91 | 91 | 95 | 92 | 90 | 92 | 86 | -- | -- | 123 |
| 144 | 77 | 61 | 81 | 91 | 92 | 93 | 82 | 89 | 87 | 74 | 77 | 108 |
| 145 | 84 | 88 | 90 | 87 | 90 | 94 | 84 | -- | -- | -- | -- | 110 |
| 146 | 81 | 86 | 77 | 74 | 88 | 82 | 80 | 77 | 70 | 79 | 86 | 104 |
| 147 | 74 | 89 | 92 | 88 | 88 | 80 | 89 | 78 | 79 | 88 | 84 | 105 |
| 148 | 81 | 90 | 71 | 78 | 86 | 87 | 84 | 72 | 70 | 83 | 77 | 112 |
| 149 | 87 | 81 | 85 | 92 | 91 | 86 | 79 | 87 | 85 | 77 | 86 | 118 |
| 150 | 85 | 90 | 88 | 93 | 92 | 90 | 90 | 84 | 97 | 91 | 89 | 98 |
| 151 | 78 | 92 | 90 | 89 | 97 | 96 | 87 | 83 | 76 | 89 | 93 | 101 |
| 152 | 79 | 82 | 91 | 86 | 82 | 74 | 71 | 86 | 89 | 81 | 82 | 101 |
| 153 | 75 | 52 | 81 | 75 | 85 | 70 | 87 | 87 | 79 | 72 | 84 | 98 |
| 154 | 82 | 89 | 84 | 76 | 72 | 85 | 72 | 90 | 83 | 83 | 82 | 113 |

| Pupil | Eng 3 | Eng 4 | Steno 1 | Steno 2 | Steno 3 | Steno 4 | Typ 1 | Bkkg 1 | Bkkg 2 | Span 1 | Span 2 | I.Q. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 155 | 80 | 74 | 64 | 74 | 83 | 77 | 58 | 74 | 81 | 68 | 86 | 103 |
| 156 | 83 | 81 | 86 | 92 | 89 | 83 | 79 | 85 | 92 | 87 | 88 | 118 |
| 157 | 77 | 82 | 87 | 84 | 83 | 88 | 92 | 76 | 80 | -- | -- | 96 |
| 158 | 74 | 80 | 85 | 85 | 82 | 91 | 93 | 73 | 82 | -- | -- | 97 |
| 159 | 88 | 92 | 94 | 90 | 91 | 90 | 85 | 94 | 94 | -- | -- | 107 |
| 160 | 82 | 85 | 85 | 88 | 87 | 89 | 96 | 89 | 92 | -- | -- | 110 |
| 161 | 79 | 76 | 71 | 78 | 73 | 77 | 84 | -- | -- | 85 | 64 | 97 |
| 162 | 78 | 79 | 79 | 82 | 90 | 87 | 86 | 72 | 70 | 74 | 70 | 100 |
| 163 | 74 | 83 | 84 | 78 | 80 | 80 | 76 | 70 | 64 | 72 | 49 | 87 |
| 164 | 71 | 84 | 77 | 64 | 70 | 70 | 77 | 70 | 72 | 75 | 76 | 98 |
| 165 | 82 | 81 | 94 | 91 | 88 | 90 | 76 | 89 | 84 | 87 | 86 | 101 |
| 166 | 80 | 82 | 80 | 82 | 85 | 81 | 84 | 83 | 84 | 64 | -- | 117 |
| 167 | 79 | 81 | 89 | 87 | 87 | 83 | 81 | 80 | 83 | 81 | 81 | 107 |
| 168 | 89 | 84 | 86 | 80 | 85 | 85 | 87 | 86 | 81 | 87 | 87 | 107 |
| 169 | 72 | 81 | 85 | 84 | 73 | 82 | 79 | -- | -- | -- | -- | 109 |
| 170 | 85 | 78 | 87 | 83 | 83 | 76 | 81 | 84 | 76 | 83 | 75 | 115 |
| 171 | 82 | 83 | 93 | 84 | 90 | 78 | 89 | 90 | 81 | 90 | 83 | 88 |
| 172 | 90 | 90 | 84 | 92 | 92 | 91 | 82 | 91 | 96 | 92 | 93 | 112 |
| 173 | 85 | 78 | 91 | 93 | 90 | 91 | 94 | 92 | 93 | -- | -- | 92 |
| 174 | 83 | 86 | 87 | 82 | 79 | 71 | 89 | -- | -- | -- | -- | 111 |

| Pupil | Eng 3 | Eng 4 | Steno 1 | Steno 2 | Steno 3 | Steno 4 | Typ 1 | Bkkg 1 | Bkkg 2 | Span 1 | Span 2 | I.Q. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 175 | 80 | 78 | 81 | 84 | 76 | 86 | 86 | 80 | 78 | 78 | 86 | 93 |
| 176 | 92 | 85 | 93 | 84 | 82 | 89 | 79 | 86 | 86 | 90 | 87 | 122 |
| 177 | 80 | 82 | 93 | 90 | 87 | 90 | 90 | 93 | 94 | -- | -- | 98 |
| 178 | 86 | 86 | 86 | 88 | 87 | 85 | 84 | 89 | 83 | 87 | 84 | 112 |
| 179 | 94 | 93 | 94 | 93 | 95 | 95 | 96 | 97 | 93 | 93 | 95 | 122 |
| 180 | 75 | 57 | 79 | 78 | 82 | 67 | 77 | -- | 88 | 84 | 81 | 101 |
| 181 | 85 | 90 | 87 | 86 | 91 | 91 | 88 | -- | -- | -- | -- | 108 |
| 182 | 89 | 85 | 85 | 89 | 92 | 88 | 83 | 92 | 89 | -- | -- | 112 |
| 183 | 80 | 73 | 90 | 83 | 89 | 85 | 80 | -- | -- | -- | -- | 112 |
| 184 | 79 | 95 | 87 | 88 | 85 | 73 | 71 | -- | -- | -- | -- | 115 |
| 185 | 90 | 72 | 78 | 72 | 78 | 85 | 81 | 89 | 84 | 89 | 92 | 118 |
| 186 | 78 | 74 | 87 | 83 | 85 | 75 | 96 | -- | -- | -- | -- | 95 |
| 187 | 77 | 86 | 80 | 82 | 83 | 81 | 89 | 79 | 80 | -- | -- | 100 |
| 188 | 81 | 85 | 88 | 88 | 86 | 83 | 87 | 88 | 92 | -- | -- | 110 |
| 189 | 74 | 76 | 70 | 75 | 82 | 85 | 78 | 71 | 78 | -- | -- | 107 |
| 190 | 75 | 74 | 66 | 79 | 90 | 84 | 81 | 81 | 79 | 65 | 84 | 110 |
| 191 | 91 | 96 | 95 | 93 | 96 | 96 | 93 | 99 | 98 | 96 | 97 | 116 |
| 192 | 86 | 89 | 74 | 83 | 83 | 80 | 72 | 87 | 85 | 81 | 85 | 112 |
| 193 | 74 | 73 | 80 | 86 | 87 | 84 | 89 | 81 | 84 | 77 | 57 | 98 |
| 194 | 91 | 79 | 86 | 84 | 89 | 84 | 77 | 87 | 76 | 89 | 88 | 98 |

| Pupil | Eng 3 | Eng 4 | Steno 1 | Steno 2 | Steno 3 | Steno 4 | Typ 1 | Bkkg 1 | Bkkg 2 | Span 1 | Span 2 | I.Q. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 195 | 91 | 83 | 83 | 85 | 81 | 80 | 73 | 93 | 81 | 89 | 85 | 108 |
| 196 | 80 | 84 | 88 | 83 | 80 | 80 | 78 | -- | -- | -- | -- | 107 |
| 197 | 79 | 74 | 71 | 78 | 84 | 86 | 87 | -- | 96 | 81 | 75 | 108 |
| 198 | 64 | 79 | 78 | 74 | 80 | 50 | 86 | 77 | 82 | 74 | 55 | 97 |
| 199 | 77 | 85 | 91 | 88 | 82 | 85 | 82 | -- | -- | -- | -- | 112 |
| 200 | 83 | 84 | 79 | 76 | 77 | 84 | 80 | -- | -- | -- | -- | 95 |
| 201 | 71 | 85 | 66 | 74 | 83 | 77 | 63 | 83 | 70 | 65 | 81 | 103 |
| 202 | 80 | 65 | 87 | 85 | 89 | 82 | 76 | -- | -- | -- | -- | 121 |
| 203 | 74 | 86 | 80 | 82 | 84 | 85 | 85 | 84 | 82 | 89 | 72 | 106 |
| 204 | 79 | 81 | 89 | 90 | 94 | 94 | 86 | 93 | 92 | 81 | 92 | 101 |
| 205 | 84 | 86 | 97 | 92 | 90 | 85 | 96 | 94 | 92 | 94 | 95 | 100 |
| 206 | 64 | 63 | 60 | 66 | 81 | 77 | 72 | 91 | 82 | 81 | 70 | 88 |
| 207 | 89 | 91 | 85 | 84 | 85 | 71 | 76 | 89 | 91 | 85 | 84 | 114 |
| 208 | 85 | 84 | 86 | 85 | 84 | 85 | 87 | 92 | 91 | 91 | 86 | 95 |
| 209 | 75 | 81 | 88 | 82 | 87 | 81 | 76 | 81 | 74 | 82 | 83 | 103 |
| 210 | 81 | 80 | 84 | 81 | 78 | 76 | 78 | 80 | 70 | 78 | 67 | 102 |
| 211 | 89 | 89 | 96 | 92 | 94 | 89 | 91 | -- | -- | -- | -- | 126 |
| 212 | 84 | 75 | 75 | 78 | 78 | 82 | 76 | 75 | 77 | -- | -- | 102 |
| 213 | 80 | 81 | 78 | 79 | 80 | 77 | 90 | 76 | 81 | 81 | 80 | 103 |
| 214 | 80 | 87 | 74 | 79 | 83 | 74 | 81 | -- | -- | -- | -- | 109 |

| Pupil | Eng 3 | Eng 4 | Steno 1 | Steno 2 | Steno 3 | Steno 4 | Typ 1 | Bkkg 1 | Bkkg 2 | Span 1 | Span 2 | I Q. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 215 | 82 | 84 | 84 | 87 | 88 | 79 | 87 | -- | -- | -- | -- | 99 |
| 216 | 89 | 89 | 94 | 92 | 91 | 86 | 89 | -- | -- | 91 | 94 | 117 |
| 217 | 82 | 72 | 82 | 75 | 79 | 81 | 80 | 84 | 78 | -- | -- | 99 |
| 218 | 82 | 81 | 85 | 80 | 72 | 75 | 71 | 87 | 90 | 75 | 81 | 103 |
| 219 | 77 | 73 | 82 | 88 | 81 | 85 | 81 | -- | 95 | 81 | 80 | 100 |
| 220 | 77 | 88 | 76 | 80 | 80 | 72 | 79 | 89 | 83 | -- | — | 101 |
| 221 | 78 | 78 | 78 | 73 | 75 | 81 | 93 | 77 | 77 | 71 | 79 | 107 |
| 222 | 84 | 83 | 86 | 84 | 77 | 73 | 81 | 82 | 88 | 87 | 79 | 96 |
| 223 | 81 | 48 | 76 | 78 | 81 | 74 | 84 | -- | -- | -- | -- | 94 |
| 224 | 74 | 86 | 83 | 74 | 75 | 81 | 82 | 75 | 65 | 67 | 82 | 100 |
| 225 | 87 | 83 | 86 | 92 | 94 | 95 | 90 | -- | — | 93 | 73 | 117 |

AGES AND SCHOLASTIC AVERAGES OF ATHERTON GRADUATES--JUNE, 1936

| Pupil | Age Yrs | Mos | Junior--Senior School Average | Pupil | Age Yrs | Mos | Junior--Senior School Average |
|---|---|---|---|---|---|---|---|
| 1 | 17 | 9 | 93 | 23 | 17 | 8 | 93 |
| 2 | 18 | 2 | 78 | 24 | 17 | 8 | 76 |
| 3 | 22 | 11 | 80 | 25 | 17 | 8 | 76 |
| 4 (s) | 17 | 7 | 81 | 26 | 18 | 0 | 76 |
| 5 | 18 | 7 | 78 | 27 (s) | 17 | 7 | 80 |
| 6 | 19 | 8 | 77 | 28 | 17 | 11 | 87 |
| 7 (s) | 17 | 6 | 92 | 29 | 17 | 8 | 84 |
| 8 (s) | 16 | 10 | 91 | 30 | 17 | 5 | 80 |
| 9 | 16 | 6 | 91 | 31 | 17 | 10 | 87 |
| 10 | 17 | 7 | 83 | 32 | 18 | 3 | 79 |
| 11 (s) | 17 | 8 | 78 | 33 | 17 | 4 | 88 |
| 12 | 18 | 6 | 92 | 34 (s) | 18 | 0 | 91 |
| 13 (s) | 17 | 7 | 80 | 35 | 18 | 2 | 87 |
| 14 | 17 | 10 | 84 | 36 | 17 | 0 | 80 |
| 15 | 17 | 3 | 93 | 37 | 17 | 10 | 91 |
| 16 | 18 | 4 | 93 | 38 | 18 | 10 | 91 |
| 17 (s) | 17 | 4 | 87 | 39 | 17 | 10 | 89 |
| 18 | 17 | 6 | 84 | 40 (s) | 17 | 11 | 77 |
| 19 | 17 | 9 | 86 | 41 | 16 | 8 | 82 |
| 20 | 17 | 5 | 94 | 42 | 18 | 1 | 86 |
| 21 | 18 | 5 | 84 | 43 | 17 | 5 | 77 |
| 22 | 17 | 6 | 95 | 44 | 16 | 7 | 79 |

(s) indicates Stenography major

AGES AND SCHOLASTIC AVERAGES OF ATHERTON GRADUATES--JUNE, 1936

| Pupil | Age Yrs-Mos | Junior--Senior School Average | Pupil | Age Yrs-Mos | Junior--Senior School Average |
|---|---|---|---|---|---|
| 45 | 17 11 | 85 | 67 | 18 0 | 78 |
| 46 (s) | 18 5 | 85 | 68 | 17 10 | 79 |
| 47 | 18 1 | 93 | 69 | 17 3 | 90 |
| 48 | 17 5 | 92 | 70 | 18 4 | 78 |
| 49 | 17 0 | 93 | 71 | 18 1 | 81 |
| 50 | 18 7 | 77 | 72 | 18 9 | 94 |
| 51 (s) | 17 8 | 81 | 73 | 16 6 | 75 |
| 52 | 17 4 | 83 | 74 | 18 5 | 92 |
| 53 | 17 8 | 80 | 75 | 16 6 | 78 |
| 54 | 17 8 | 77 | 76 (s) | 16 2 | 78 |
| 55 | 18 4 | 77 | 77 | 17 9 | 91 |
| 56 | 16 8 | 79 | 78 | 16 6 | 88 |
| 57 (s) | 18 9 | 78 | 79 | 16 10 | 96 |
| 58 | 17 6 | 85 | 80 | 18 1 | 96 |
| 59 | 18 0 | 88 | 81 | 17 5 | 88 |
| 60 | 18 0 | 85 | 82 | 17 5 | 90 |
| 61 | 17 5 | 76 | 83 | 16 10 | 75 |
| 62 | 17 7 | 93 | 84 | 17 10 | 88 |
| 63 | 17 3 | 90 | 85 | 17 0 | 87 |
| 64 | 17 10 | 82 | 86 | 17 11 | 95 |
| 65 | 18 0 | 83 | 87 (s) | 18 3 | 81 |
| 66 | 17 7 | 82 | 88 (s) | 17 6 | 79 |

(s) indicates Stenography major

AGES AND SCHOLASTIC AVERAGES OF ATHERTON GRADUATES--JUNE, 1936

| Pupil | Age Yrs-Mos | | Junior--Senior School Average |
|---|---|---|---|
| 89 | 16 | 8 | 83 |
| 90 | 17 | 6 | 80 |
| 91 | 17 | 11 | 85 |
| 92 | 17 | 11 | 85 |
| 93 | 18 | 1 | 88 |
| 94 | 17 | 4 | 80 |
| 95 | 17 | 9 | 82 |
| 96 | 18 | 5 | 85 |
| 97 (s) | 17 | 5 | 83 |
| 98 (s) | 17 | 6 | 79 |
| 99 | 19 | 1 | 91 |
| 100 | 18 | 6 | 90 |
| 101 | 17 | 10 | 93 |
| 102 | 17 | 6 | 93 |
| 103 | 17 | 11 | 83 |
| 104 | 16 | 6 | 96 |
| 105 | 17 | 3 | 89 |
| 106 | 17 | 5 | 85 |
| 107 | 17 | 6 | 87 |
| 108 | 17 | 0 | 80 |
| 109 (s) | 18 | 0 | 77 |
| 110 (s) | 19 | 2 | 81 |
| 111 (s) | 17 | 10 | 92 |
| 112 | 17 | 11 | 91 |
| 113 | 16 | 11 | 91 |
| 114 | 18 | 2 | 96 |
| 115 (s) | 18 | 0 | 82 |
| 116 | 17 | 8 | 82 |
| 117 | 17 | 7 | 84 |
| 118 | 17 | 3 | 86 |
| 119 | 17 | 10 | 86 |
| 120 | 18 | 11 | 90 |
| 121 | 18 | 6 | 86 |
| 122 (s) | 18 | 1 | 85 |
| 123 (s) | 18 | 9 | 82 |

(s) indicates Stenography major

Facsimile of Cards Used in Collecting Raw Data

| Class | Grade | Grade | I.Q. |
|---|---|---|---|
| Stenography I | English III | | |
| Stenography II | English IV | | |
| Stenography III | | | |
| Stenography IV | | | |

| Course | Grade | x | $x^2$ | Course | Grade | x | $x^2$ |
|---|---|---|---|---|---|---|---|
| Bkkg. 1 | | | | Typing 1 | | | |
| Bkkg. 2 | | | | Typing 2 | | | |
| Bkkg. 3 | | | | Typing 3 | | | |
| Bkkg. 4 | | | | Typing 4 | | | |
| | | | | For. L.1 | | | |
| | | | | For. L.2 | | | |